July 2021

Binder 180, Plagiorchiidae T-Z [Trematoda Taxon Notebooks]

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Tetrapapillatrema n. g. Ralph, 1938

Diagnosis. Plagiorchioidean flukes.

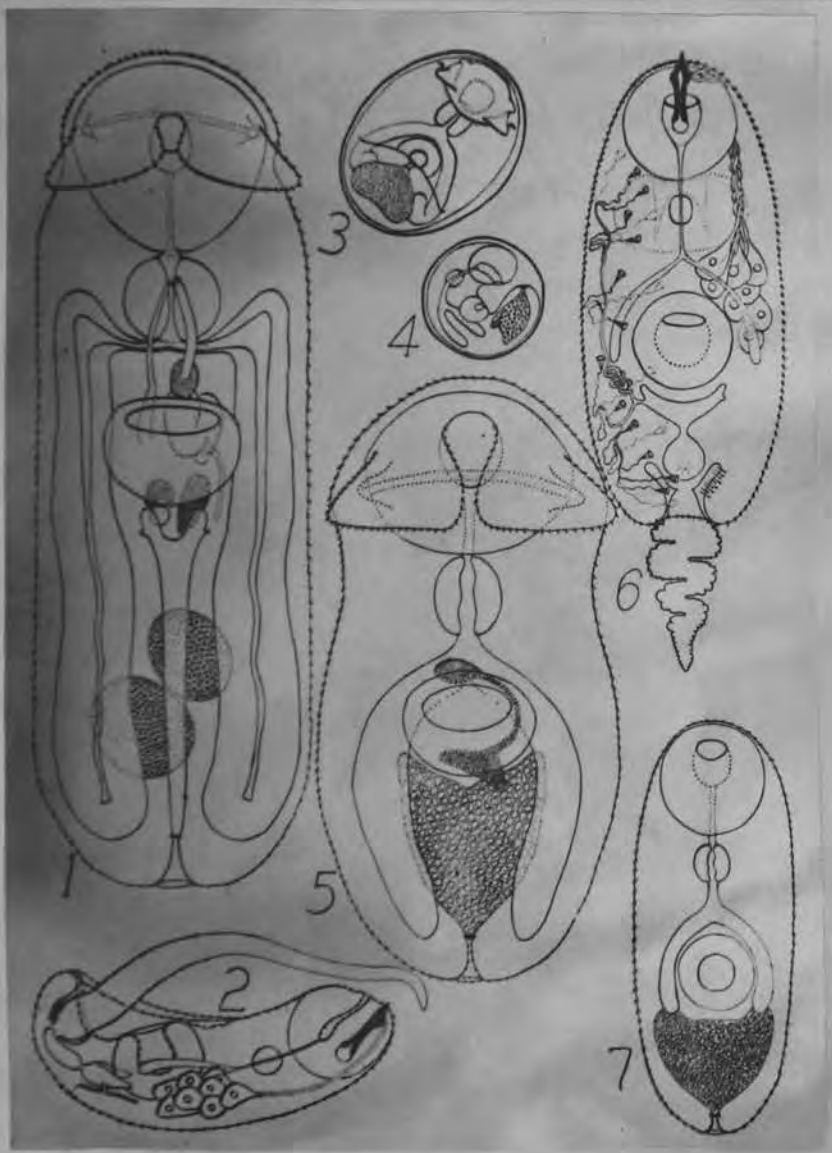
Parthenitae: simple, short, plump, in snails.

Cercaria: belongs to Polyadena Group of "Cercariae Armatae"; xiphidiate; brevicaecate; 8 pairs of penetration glands; flame cell pattern—2[(3+3+3)+(3+3+3)]; excretory bladder Y-shaped with short anterior diverticula to which the principal excretory canals connect laterally (not anteroterminally); "caudal pocket" with prominent internal spines; pharynx large; body with pronounced posteroventral concavity.

Metacercaria: oral sucker with 4 papillae; encysted in various tissues of tadpoles.

Adult: densely spinous all over; oral sucker larger than acetabulum, with 4 muscular papillae; acetabulum subequatorial; pharynx very prominent; prepharynx and oesophagus practically wanting; caeca large, thick-walled, extend to posterior end of body; genital pores ventrosubmedian at level of pharynx; ovary immediately postacetabular, submedian; testes tandem, close together, far from ovary, near posterior end of body; parasitic in gut of fresh-water turtles.

Type species. *Tetrapapillatrema concavocorpa* (Sizemore).



Subadult marita of *Tetrapapillatrema concavocorpa* (Sizemore) Ralph, 1938

Description. Measurements, length×width, in microns, of 10 preserved specimens mounted *in toto*. Body 608 (592–704)×260 (216–280); oral sucker (exclusive of papillae) 150 (128–164)×153 (142–181). Width of oral sucker through ventral papillae 201 (174–215). Length of papillae on oral sucker—ventral 21 (10–30), dorsal 15 (10–21). Diameter of pharynx 95, of acetabulum 114 (106–127), of anterior testis 70, posterior testis 76. Caeca 433 (376–520)×70. Urinary bladder 258 (204–296). Distance from center of acetabulum to posterior end of body 361, to anterior end 319.

Spination pronounced and dense. Spines progressively smaller posteriad. Oral sucker and papillae as described above for metacercaria. Pharynx very prominent. Prepharynx and oesophagus very short or absent. Caeca very wide with thick walls, extend to posterior tenth of body. Urinary bladder long, slender, cylindrical, terminates anteriad in a pair of small short blind cornua near ovary. Principal excretory collecting tubes arise from lateral surfaces (not anterior ends) of the diverticula. Excretory pore, guarded by a prominent sphincter, located at apex of a funnel-shaped invagination of the posteroterminal integument as in the metacercaria. This invagination, perhaps, corresponds to the "caudal pocket" (fig. 6.) in the cercaria which surrounds the base of the tail.

Genital pores nearly median at level of anterior half of pharynx. Testes nearly, or quite contiguous, tandem in more advanced specimens, oblique in younger ones, dorsal to caeca and urinary bladder near posterior end of body and somewhat remote from ovary—the anterior testis smaller. Cirrus complex pronounced; includes large sperm-filled S-shaped seminal vesicle dorsolateral to acetabulum, prostate gland, and ejaculatory canal. Ovary small, ovoidal, submedian, indifferently dextral or sinistral, immediately caudad to acetabulum. Mehlis' gland and seminal receptacle, the former anterior to the latter, located contralateral to, and almost in contact with, the ovary. Anterior end of uterus recognizable, contains sperms, contralateral to ovary and cirrus complex. Vitellaria and proximal portion of uterus not recognizably developed.

First Intermediate Host. *Helisoma trivolvis* (Say).

Second Intermediate Host (Experimental). *Rana catesbeiana* Shaw.

Definitive Host (Experimental). *Chelydra serpentina* (Linné).

Habitat of Metacercaria. Any tissue of tadpole.

Habitat of Adult. Lumen of small intestine.

Museum Material. Several microscope slides of metacercariae and subadults mounted *in toto* in the United States National Museum.

Discussion

T. concavocorpa is in full accord with the diagnosis of the superfamily Plagiorchioidea Dollfus 1930 as emended by McMullen (1937). Insofar as the incompletely developed condition of the reproductive system permits it compares favorably with the definition of the Telorchiinae Looss 1899 given by Perkins (1928), except for the presence of the muscular papillae on the oral sucker. As far as I have been able to determine no genus (and there are in the neighborhood of 100) of the entire superfamily Plagiorchioidea has 4 muscular papillae on the oral sucker. *Eustomus chelydrae* MacCallum (redescribed by McMullen, 1935) of the Plagiorchiinae Pratt has 2 such papillae. The Auridistominae resemble the Telorchiinae except for a pair of paraoral lappets. The lappets, however, are apparently merely integumentary processes that do not affect the shape or musculature of the sucker. In general structure of the cercaria and details of the life history the present form resembles *Cercorchis medius* (Stunkard), a telorchid studied by McMullen (1934). In view of the immature condition of my

TETRAPAPILLATREMA

Tremiorchis Mehra et Negi, 1926

Syn. *Centrovitus* Bhalerao, 1927

Generic diagnosis. — Plagiorchiidae, Plagiorchiinae: Body elliptical to lanceolate, spinulate. Acetabulum larger than oral sucker, in anterior half of body. Pharynx well developed. Esophagus of moderate length. Ceca short, terminating in midregion of body. Testes diagonal, in middle third of body. Cirrus pouch curving round acetabulum. Genital pore just in front of acetabulum. Ovary a little out of median line behind acetabulum. Vitellaria extending along ceca, commencing at level of genital pore or acetabulum. Uterine coils reaching to posterior extremity; eggs small. Excretory vesicle Y-shaped, with long stem and short arms. Intestinal parasites of amphibians and reptiles.

Genotype: *T. ranarum* **Mehra et Negi, 1926 (Pl. 43, Fig. 529), syn.** *Centrovitus pentadelphi* **Bhalerao, 1926, in** ***Rana tigrina;*** **India.**

Representatives from reptiles:

T. varani Verma, 1930 (Pl. 47, Fig. 571), in *Varanus bengalensis* and *V. griseus;* India.

TREMIORCHIS Mehra and Negi 1925

Body spiny, of moderate size, elliptical or ovoidal, extremities rounded. Oral sucker subterminal, larger or smaller than ventral; prepharynx very short, pharynx globular; esophagus moderately long; intestinal ceca terminate about middle of body. Testes obliquely behind one another, anterior in first or second half of body, posterior always in second half. Cirrus sac curved like a half moon over ventral sucker. Ovary median or submedian, behind ventral sucker. Vitellaria lateral, along part or whole length of intestinal ceca. Seminal receptacle large, with long Lauer's canal arising from it. Uterus voluminous, coiled as far as posterior end. Excretory bladder with a very long stem extending cephalad to both testes, horns short or moderately long; pore terminal or subterminal, dorsal or ventral. Eggs nearly twice as long as broad, operculated

Type species: Tremiorchis ranarum Mehra & Negi

Synonym: Centrovitus Bhalerao 1926

References: Bhalerao, G.D. 1926. On the trematodes of the digestive tract of a common Indian Frog, Rana tigrina, with a description of Centrovitus pentadelphi n.g., n.sp. Parasit. 18:154-9

Mehra, H.R. and Negi, P.S. 1925. A new trematode Tremiorchis ranarum n.g.,n.sp from Rana tigrina. Proc. 12th Ind. Sci. Con. p.147

-----,-----, 1926. On a new trematode, Tremiorchis ranarum n.g.n.sp. from the common Indian Frog, Rana tigrina. Parasit. 18: 168-81.

Verma, S.C. 1930. On the Synonymy of the genera Tremiorchis et. Parasit.22:302-312.

Verma considers this genus as showing relationships to the genus Mediorhyma (of Travassos' group c) and to Stiphlodora (of Travassos' group b).

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KEY TO THE SPECIES OF *Tremiorchis*

1. Oral sucker smaller than acetabulum; anterior testis behind middle of body; ovary rounded; seminal receptacle kidney-shaped; vitelline follicles arranged in groups. (Intestine of *Rana tigrina;* India; fig. 79.) ..... *T. ranarum* Mehra and Negi 1926.
   Oral sucker larger than acetabulum; anterior testis in first half of body; ovary pear-shaped; seminal receptacle long, twisted; vitelline follicles not arranged in groups. (Intestine of *Varanus;* India; fig. 80.) ..... *T. varnum* Verma, 1930.

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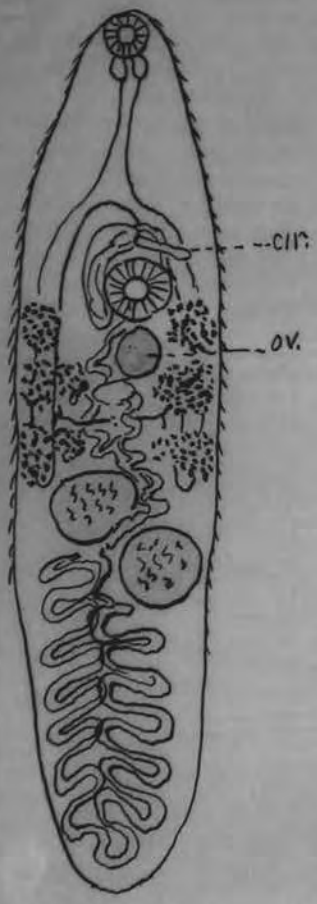


Centrovitus
pentadelphi
B Kalerao 1926
from intestine
Rana Tigrina

Tremiorchis ranarum
Mehra & Negi 1926
from intestine
Rana tigrina

Tremiorchis ranarum Mehra et Negi, 1925

(Рис. 174)

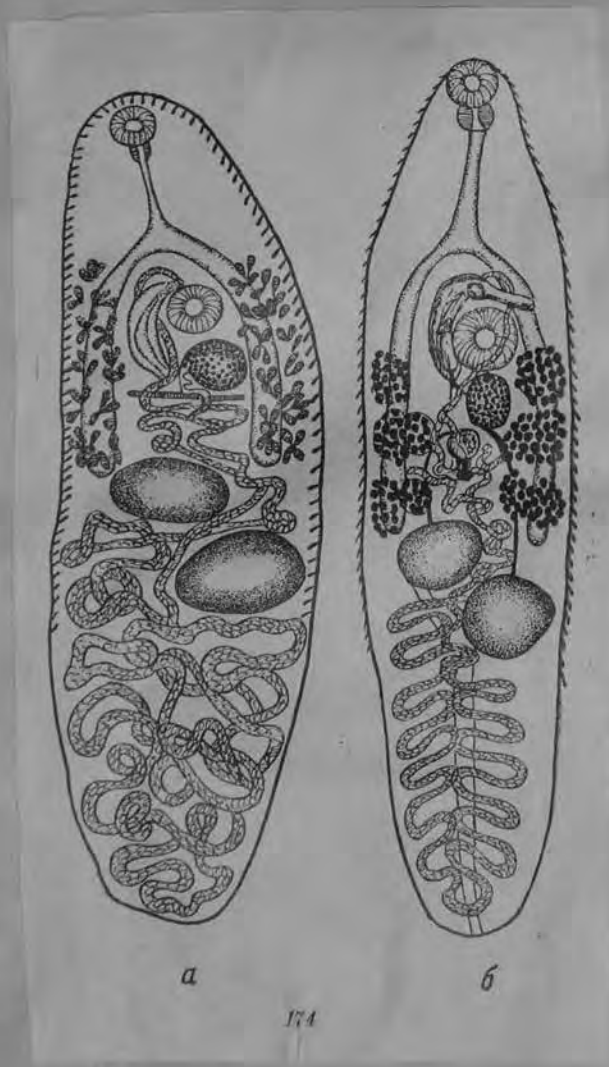
Синоним: *Centrovitus pentadelphi* Bhalerao, 1926

Хозяин: лягушка — *Rana tigrina*.

Локализация: пищевод, дуоденум и кишечник.

Место обнаружения: Индия.

Описание вида (по Мэра и Нэги, 1926). Мелкие трематоды 3,8—5,02 мм длины и 0,96—1,32 мм ширины в области брюшной присоски. Все тело, за исключением задней $^1/_5$ части, покрыто мелкими шипиками треугольной формы. Ротовая и брюшная присоски сферической формы, причем брюшная присоска всегда больше ротовой. Ротовая присоска 0,28—0,34 мм в диаметре, расположена субвентрально. Брюшная присоска 0,38—0,42 мм, лежит на расстоянии 1,1—1,44 мм от переднего конца тела. Половые отверстия находятся рядом, впереди брюшной присоски. Половой синус отсутствует. Экскреторное отверстие расположено на вентральной поверхности, немного впереди от заднего конца тела. Ротовое отверстие ведет в очень маленький, тонкостенный префаринкс. Фаринкс мышечный, сферический, 0,12—0,18 мм в диаметре. Пищевод 0,4 мм длины. Кишечные стволы простираются до переднего края переднего семенника, но никогда не заходят во вторую половину тела. Диаметр кишечных ветвей в два раза больше диаметра пищевода. В незрелых экземплярах кишечные стволы могут спускаться на $^2/_3$ длины тела.



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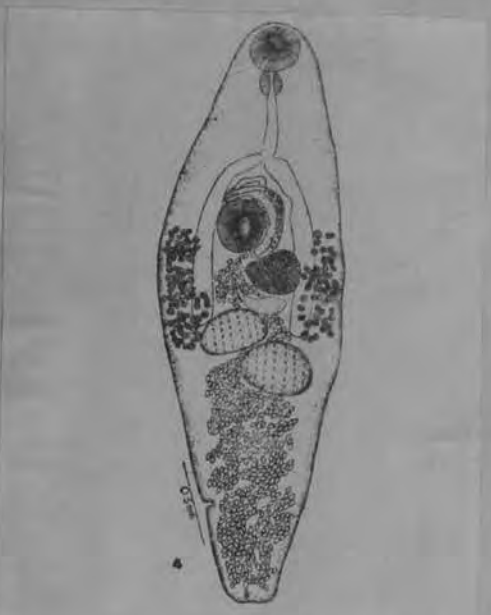
TREMIORCHIS RANARUM (MEHRA ET NEGI, 1926)
(Fig. 4)

Only four specimens of this form were recovered from the intestine of a frog *Rana tigrina*. These specimens differ from the original in the extent of vitellaria, intestinal caeca and the position of genital pore which in the opinion of the author are minor points.

Body 3.24-4.4 × 1.0-1.23 mm. in size. Cuticle covered with spines extending from anterior end up to a little posterior to hind end of posterior testis. Oral sucker, 0.26-0.30 × 0.27-0.3 mm. in size. Prepharynx small and thin walled; pharynx muscular, 0.15-0.18 × 0.13-0.16 mm. in size; oesophagus long, tubular, straight or slightly curved, 0.33-0.63 mm. long. Intestinal caeca extending upto anterior or hind end of anterior testis. Ventral sucker, larger than oral sucker, 0.31-0.38 × 0.29-0.33 mm. in size at 1.0-1.5 mm., i.e. about 1/3rd of body length from anterior extremity. Excretory pore lies on dorsal side at hind end of body. Excretory bladder Y-shaped, extending forward beyond testes, then divides into right and left branches. Genital pore lies behind intestinal bifurcation closely in front of ventral sucker. Testes entire, subequal, close or away from each other, equatorial and separated from each other by uterine coils. Anterior testis, 0.27-0.34 × 0.32-0.4 mm. in size; posterior testis larger than anterior testis, 0.29-0.35 × 0.39-0.45 mm. in size. Cirrus sac long, 0.69-0.76 × 0.14-0.2 mm. in size, flask-shaped and curved lying on right side of ventral sucker extending from a little behind to intestinal bifurcation to a little distance behind ventral sucker where it ends anterior to ovary. Vesicula seminalis bipartite, narrow, occupies about 1/3rd of length in the cirrus sac. Distal end, 0.18-0.24 × 0.06-0.09 mm. in size separated by a constriction from the proximal part, 0.20-0.28 × 0.05-0.08 mm. pars prostatica, 0.06-0.08 × 0.03-0.04 mm. in size; ejaculatory duct, 0.09-0.15 mm. in length; cirrus muscular and non-spiny. Ovary entire, 0.24-0.27 × 0.27-0.33 mm. in size, triangular or oval, pre-equatorial situated in close proximity behind ventral sucker or away from it. Receptaculum seminis pear-shaped, lying close behind ovary or left side of Mehlis' gland cells, 0.2-0.28 × 0.10-0.12 mm. in size. Vitellaria follicular, extending from middle of ventral sucker upto termination of caeca or to anterior end of posterior testis. They are mainly lateral in position covering the intestinal caeca. Uterus transversely coiled, occupying entire space behind ovary. Eggs small and non operculated, 0.02-0.044 × 0.012-0.021 mm. in size.

Host : *Rana tigrina*
Location : Intestine.
Locality : Lucknow.



TREMIORCHIS RANARUM (Mehra et Negi, 1926)

V. AGRAWAL, 1966
INDIAN J. HELMINTHOL. 18(1): 82-90

TREMIORCHIS RANARUM Mehra & Negi 1925.

Syn. *Centrovitus pentadelphi* Bhalerao, 1926. *Tremiorchis Mehrai* Rai, 1962. *Tremiorchis vitelloconfluentum* Rai, 1962.

(Fig. 2)

Two specimens of this parasite were collected from *Rana tigrina* from Calcutta. Body elongated, tapering at two ends, measures 4.09-4.14×1.03-1.10. Cuticular spines present, extending from anterior end to a little behind posterior level of posterior testis. Anterior part thickly covered with spines which become sparser posteriorly and disappear in hinder part. Oral sucker subterminal, rounded, measures 0.21-0.23 in diameter. Prepharynx short. Muscular pharynx measures 0.09-0.17×0.18. Oesophagus 0.36-0.58×0.07-0.16, bifurcates into caeca which extend upto middle of anterior testes. Ventral sucker in posterior portion of anterior third of body, measures 0.24×0.23—0.25.

Testes diagonally tandem, ovoid. Anterior testis measures 0.32-0.40×0.33-0.40 and posterior one 0.29-0.33×0.43-0.45. Cirrus sac long, curved, lying left of ventral sucker and extending a little behind ventral sucker, measures 0.63-0.74×0.16-0.18. Narrow vesicula seminalis occupies one third of length of the cirrus sac, continues anteriorly into pars prostatica and opens through ejaculatory duct into genital opening.

Fig 2

Ovary ovoid, pretesticular, posterior to ventral sucker just below cirrus pouch, intercaecal, measures 0.18-024×0.20-0.27. Receptaculum seminis and shell gland situated postero-lateral to ovary. Vitellaria follicular, in two lateral fields, extending from behind level of ventral sucker to little behind caecal terminations, overlaping caeca and intruding into intracaecal field at some places. Uterine coils packed posterior part of body in posttesticular zone and extend anteriorly through narrow intertesticular space to genital pore located just anterior to ventral sucker. Excretory pore terminal. Eggs measure 0.026-0.031 ×0.009-0.012.

Host : *Rana tigrina.*
Location : Intestine.
Locality : Calcutta.

Our specimens agree with that of MEHRA and NEGI (1925) in other characters except the extension of vitellaria. In the anterior extension of vitellaria the present form agrees with the description given by BHALERAO (1926) and VERMA (1930) but posteriorly it extends a little beyond the caecal ends.

Tremiorchis varanum Verma, 1930 the only other species described from reptiles viz. *Varanus bengalensis* and *V. griseus* differs from type species *T. ranarum* Mehra and Negi, 1925 in such important characters as the extension of caeca and position of testes. Further the sigmoid curve of the excretory stem in this species shows closer affinities with the genus *Astiotrema* Looss, 1900 than that of *Tremiorchis* Mehra and Negi, 1925. So it can more conveniently be accommodated in that genus. As such the present authors exclude *T. varanum* from the genus *Tremiorchis* Mehra and Negi, 1925 and place it under *Astiotrema* Looss, 1900.

Rai (1962) described two species of the genus *Tremiorchis*-viz *T. mehrai* and *T. vitelloconfluentum* and differentiated them from the known species mainly on the ratio of suckers, extension of caeca and the nature and distribution of vitellaria. Bhalerao (1962) and other workers have reported that these characters are variable in great extent in this genus, as such these characters can not be taken for differentiating species. So we consider that the two species reported by Rai (1962) as synonym to *T. ranarum* Mehra and Negi, 1925.

From Mukherjee and Ghosh, 1970

Tremiorchis ranarum Mehra and Negi, 1926
(Fig. 21)

The following description is based on 20 worms collected from 4 specimens of *Rana tigrina* from Lahore and Sahiwal.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The body of fluke is somewhat spindle-shaped with maximum breadth at about the equator. The extremities are rounded. The colour of the worm is white but in mature worms the eggs impart a light brown tinge to the uterine region of the worm. The tegument is beset with numerous minute backwardly directed spines. The spination extends from the anterior end to the anterior three-fourth of the worm with slight variations. The distribution of the spines becomes gradually sparser anteroposteriorly.

The oral sucker is smaller than the ventral sucker and subterminal in position. The ventral sucker is situated in the anterior half of the worm, at a distance of 0.697 mm from the anterior extremity. The oral sucker is followed by a short prepharynx which is best seen in the live material while in the fixed material it can be obliterated from the view due to some contraction during fixation. The pharynx is smaller than the oral sucker and broader than long. The oesophagus is fairly long, slightly curved to one side, attaining maximum width at its beginning. The intestinal fork lies at a distance of 0.576 mm from the anterior extremity and 0.147 mm in front of the ventral sucker. The intestinal caeca are broader than the oesophagus and extend to the middle of the body but in some individuals they extend a little beyond.

The testes are obliquely placed one behind the other. The anterior testis is smaller and equatorial in position; while the posterior testis is always postequtorial. In the properly fixed specimens the testes are spherical with regular outline. The cirrus sac is well-developed, slightly curved and twice as large as the ventral sucker and extends from the middle of the ovary to the posterior border of the intestinal fork.

The genital pore is postbifurcal. In the specimens fixed without pressure the cirrus pouch remains dorsal and median; while in the specimens fixed under pressure or pressed while mounting, it becomes displaced to one side. Enclosed within the cirrus sac are a long vesicula seminalis, a less voluminous pars prostatica, a narrow ductus ejaculatorius and a protrusible cirrus. The ovary is spherical in outline, situated at a short distance behind the ventral sucker, submedian in position and partly overlaps right caecum. The vitellaria, extending between the acetabulum and the anterior testis, are follicular, arranged in 5-5 groups on each side. For the most part they are extracaecal but at places they may surround the caeca or even protrude into the intercaecal field. Each group of vitellaria consists of 14-25 small acini. The uterus is much convoluted with a descending limb passing posteriorly between the testes and thrown into numerous irregular coils behind the testes filling most of the post-testicular zone upto the posterior end. Finally it ascends again passing through the intertesticular space running along the cirrus sac as a metraterm to open through the female genital aperture into gential atrium. The aggs are small, oval, operculate, unembryonated and light brown in colour. The excretory pore is subterminal and median. The base of the excretory bladder is quite expanded but becomes comparatively narrow anteriorly. It passes through the intertesticular zone to the anterior level of the anterior testis where it is joined by two limbs.

Host: *Rana tigrina*
Location: Intestine
Localities: Lahore and Sahiwal

DISCUSSION

The specimens under study agree in all essential features with *T. ranarum*.

MEASUREMENTS

(All measurements in millimetres)

Body length	3.030 – 3.181
Body breadth	0.727 – 0.788
Oral sucker	0.206 – 0.245 × 0.196 – 0.245
Ventral sucker	0.255 – 0.294 × 0.255 – 0.284
Pharynx	0.098 – 0.127 × 0.107 – 0.147
Oesophagus	0.196 – 0.294
Anterior testis	0.226 – 0.284 × 0.236 – 0.294
Posterior testis	0.236 – 0.294 × 0.245 – 0.343
Ovary	0.206 × 0.167 – 0.225
Cirrus sac	0.484 – 0.546
Size of the spines	0.017 – 0.020
Eggs	0.015 – 0.030 × 0.012 – 0.017

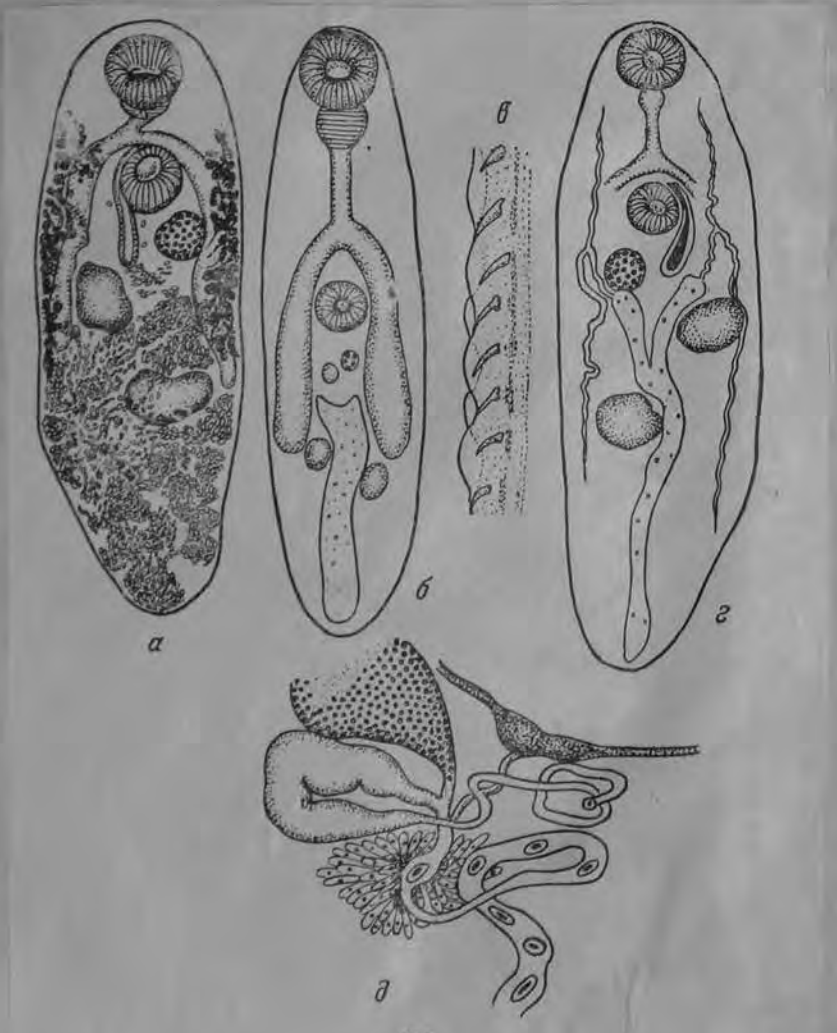
From BHUTTA AND KHAN, 1975

Tremiorchis varanum Verma, 1930

(Рис. 175)

Хозяева: вараны — *Varanus bengalensis*, *Varanus griseus*.
Локализация: кишки.
Место обнаружения: Индия.

Описание вида (по Верма, 1930). Тело белого цвета, за исключением области матки, которая, будучи наполнена светло-коричневыми яйцами, придает этот же цвет и телу. Совершенно вытянутая живая трематода имеет веретеновидную форму, но после фиксации принимает овальные очертания с закругленными концами, причем длина тела очень варьирует в зависимости от степени сокращения. Длина тела вытянутых экземпляров достигает 1,5—3 мм, а сократившихся — 1,2 мм; ширина впереди брюшной присоски достигает 0,24—0,28 мм, а между брюшной присоской и задним семенником 0,42 мм. У сократившихся экземпляров ширина на соответствующих уровнях равна 0,4 мм и 0,7 мм. Кутикула покрыта мелкими, но ясно заметными шипиками, доходящими до уровня заднего семенника; затем количество шипиков быстро уменьшается, хотя на вентральной поверхности они простираются с большими интервалами до заднего конца тела. Ротовая присоска вентро-терминальная, с толстыми мышечными стенками, достигает 0,21—0,25 мм в диаметре; она крупнее брюшной, достигающей 0,18—0,21 мм. Последняя лежит в начале второй четверти или средней трети длины тела у взрослых экземпляров и приблизительно на середине тела у незрелых. Префаринкс очень короткий, фаринкс шаровидный, достигает около $^1/_3$ размера ротовой присоски. Довольно длинный пищевод достигает конца передней трети длины тела у молодых экземпляров и конца передней четверти или пятой части длины тела у взрослых. Кишечные стволы оканчиваются у незрелых паразитов в начале задней трети тела, а у взрослых несколько позади его середины.



Tremiorchis mehrai n.sp. Rai, 1962

Twelve parasites of this species were collected from the intestine of the common Indian toad, *Bufo melanostictus* Schneid, from Ghamapur locality in Jabalpur. The body spines are directed posteriorly and in the living condition they appear to extend from the anterior end of the body to a little behind the posterior margin of posterior testis. They measure 0·017–0·024 mm. in length and 0·010 mm. in breadth at the base. The body, in eight mounted specimens, measures 0·75–0·79 mm. in length and 1·37–1·48 mm. in maximum breadth at the post-ovarian region.

The oral sucker is terminal and is always bigger than the ventral sucker. It measures 0·268–0·299 mm. in length and 0·268–0·331 mm. in breadth. The ventral sucker lies at a distance of 1·12–1·58 mm. from the anterior end of the body and measures 0·225–0·268 mm. in length and 0·236–0·252 mm. in breadth. The prepharynx is very small and leads into a muscular pharynx which measures 0·157–0·189 mm. in length and 0·178–0·189 mm. in breadth. The oesophagus measures 0·473–0·567 mm. in length and 0·063–0.094 mm. in breadth. The intestinal bifurcation lies at a distance of 0·931–1·23 mm. from the anterior end of the body. The caeca end a little above the equator of the body and their posterior tips end in front of the anterior testis.

The excretory system is 'Y' shaped, with a long stem and small cornuae. The stem of the excretory bladder extends to the posterior border of the ovary. From each cornua arises a common excretory duct, which further divides into two factors, one going towards the anterior end and the other towards the posterior side. The excretory pore lies at the posterior end of the body.

The testes are oval to spherical in shape. The anterior testis measures 0·394–0·631 mm. in length and 0·411–0·71 mm. in breadth and lies just behind the equator of the body. The posterior testis is obliquely situated behind the anterior testis and the distance between the two testes measures 0·031–0·1 mm. The posterior testis measures 0·394–0·741 mm. in length and 0·411–0·689 mm. in breadth. The vasa efferentia, arising from the anterior face of each testis, meet to form a vas deferens, which opens into the cirrus sac. The cirrus sac is curved and overlaps a part of the ventral sucker; it measures 0·473–0·583 mm. in length and 0·078–0·[illegible] mm. in breadth. It is situated on the right side of the ventral sucker and contains a small tubular vesicula seminis, a tubular para-prostatica and a long tubular cirrus. The genital pore lies just in front of the ventral sucker.

The ovary is oval to spherical, submedian in position, and generally lies on the right side of the median line of body. It measures 0·331–0·363 mm. in length and 0·299–0·411 mm. in breadth. The oviduct, arising from the posterior side of the ovary, runs posteriorly to meet the duct of the receptaculum seminis. Laurer's canal is present and appears to be a posterior elongation of the receptaculum seminis. The receptaculum seminis measures 0·175–0·252 mm. in length and 0·[illegible]–0·441 mm. in breadth. The oviduct is then joined by a duct from the vitelline reservoir to form the Mehlis' gland. The vitelline follicles are arranged in groups of 3 to 8 cells and they extend from the anterior level of ventral sucker to the level of the equator of anterior testis. The transverse vitelline ducts join to form a vitelline reservoir. The vitelline reservoir measures 0·041–0·[illegible] × 0·15–0·14 mm. in size.

The uterus has descending and ascending coils, contains numerous eggs, and extends a little above the posterior margin of the body. The eggs are operculate and measure 0·028–0·031 mm. in length and 0·008–0·014 mm. in breadth.

Host : *Bufo melanostictus Schneid.*

Habitat : Small intestine.

Locality : Ghamapur, Jabalpur (M. P.).

REMARKS

Among the only two previously described species *T. ranarum* Mehra and [illegible] 1936, (Syn. *Centrovitus pentadelphi* Bhalerao, 1926) and *T. varanum* Verma, 1930, the new species *Tremiorchis mehrai* resembles *Tremiorchis varanum* Verma, 1930, in the size of the suckers, *i.e.*, the oral sucker being always bigger than the ventral sucker. The new species, however, differs from *T. varanum* Verma, 1930, in the extension of intestinal caeca, position of testes, position of ovary, extension and nature of vitelline follicles, smaller size of its egg and its larger body size.

FIG. 1.

Tremiorchis mehrai n.sp. Dorsal vie

Tremiorchis vitelloconfluentum n.sp. Rai, 1962

Three specimens of this species were collected from the small intestine of the common Indian Frog, *Rana tigrina* Daud., brought from Piparia, 111 miles from Jabalpur.

The boby of the worm is covered densely with small cuticular spines, directed posteriorly, up to three fourth part of the body. The spines are triangular in shape. The body measures from 2·398–4·05 mm. in length and 0·656–1 mm. in breadth, the maximum breadth being at the acetabular region.

The oral sucker is terminal and measures 0·147–0.157 mm. in length and 0·15–0·175 mm. in breadth. The ventral sucker is bigger than the oral sucker, it lies at a distance of 0·741–0·951 mm. from the anterior end of the body and measures 0·171–0·252 mm. in length and 0·189–0·268 mm. in breadth. The mouth leads into a small prepharynx (observed only in the living condition), which opens into a well developed pharynx, the latter measuring 0·102–0·11 mm. in size. The pharynx leads into a moderately developed oesophagus, 0·331–0·347 mm. in length and 0·055–0·094 mm. in breadth. The intestinal bifurcation lies at a distance of 0·71 mm. from the anterior end of the body. The intestinal caeca end blindly, slightly above or at the level of the middle of the body and their posterior tips are pretesticular.

The excretory bladder is 'Y' shaped, with a long stem and small cornuae. The stem of the excretory bladder extends to the posterior end of the anterior testis and then divides into two cornua. From each cornua arises a common duct, which divides into two factors. These two excretory factors run in opposite directions, *viz.*, the anterior and the posterior, and each receives the collecting tubes of its side. The excretory pore lies at the posterior end of the body.

The testes are oval in shape, lying obliquely one behind the other and are situated in the posterior half of the body. The anterior testis measures 0·252–0·331 mm. in length and 0·173–0·236 mm. in breadth. The posterior testis lies at a distance of 0·015–1·4 mm. from the posterior margin of anterior testis, and measures 0·22–0·236 mm. in length and 0·236–0·362 mm. in breadth. The cirrus sac is large, curved and has thick muscular walls. It lies on the right side of the ventral sucker and measures 0·284–0·473 mm. in length and 0·071–0·102 mm. in breadth. It contains an elongated vesicula seminis, measuring 0·122–0·168 mm. in length and 0·035–0·038 mm. in breadth, a tubular pars-prostatica and a long tubular cirrus. The genital pore lies in front of the ventral sucker.

The ovary is oval, median, and lying at a distance of 0·014–0·015 mm. from the posterior end of the ventral sucker. It measures 0·181–0·236 mm. in length and 0·173–0·22 mm. in breadth. The oviduct arises from the posterior end of the ovary, runs posteriorly and joins the duct of the receptaculum seminis. The receptaculum seminis is quite small. Laurer's canal is not observed.

The vitelline follicles extend anteriorly to the middle of the ventral sucker and posteriorly to the anterior level of the anterior testis. The remarkable features of the vitelline follicles noted in this species are that they are not arrangad in groups as described by Mehra and Negi, (1926), in *Tremiorchis ranarum* and are confluent in the ovarian region (Fig. 2). Due to this confluent nature of the vitelline follicles the species is named, *Tremiorchis vitelloconfluentum*. The follicles of the two sides are joined through their respective vitelline ducts to form a common vitelline reservoir, which then gives rise to a duct extending anteriorly and joining the oviduct to form the ootype.

The uterus is densely coiled and there are descending and ascending coils of uterus ; its posterior limit reaching up to the posterior extremity of the body. The eggs are operculate, yellowish in colour, and measure 0·028–0·035 mm. in length and 0·007–0·01 mm. in breadth.

Host : *Rana tigrina* Daud.

Habitat : Small intestine.

Locality : Piparia, 111 miles from Jabalpur (M.P.)

REMARKS

Tremiorchis vitelloconfluentum n.sp. resembles *T. ranarum* Mehra and Negi, 1926, (Syn. *Centrovitus pentadelphi* Bhalerao, 1926) in the size of its suckers (the ventral sucker being larger than the oral sucker). However, the new species differs from *T. ranarum* Mehra and Negi, 1926, (Syn. *Centrovitus pentadelphi* Bhalerao, 1926) in its general spination, extension of excretory bladder, extension and nature of the vitelline follicles. The new species differs from all the species of the genus in its confluent nature of the vitelline follicles in the ovarian region, which is considered here to be of specific importance.

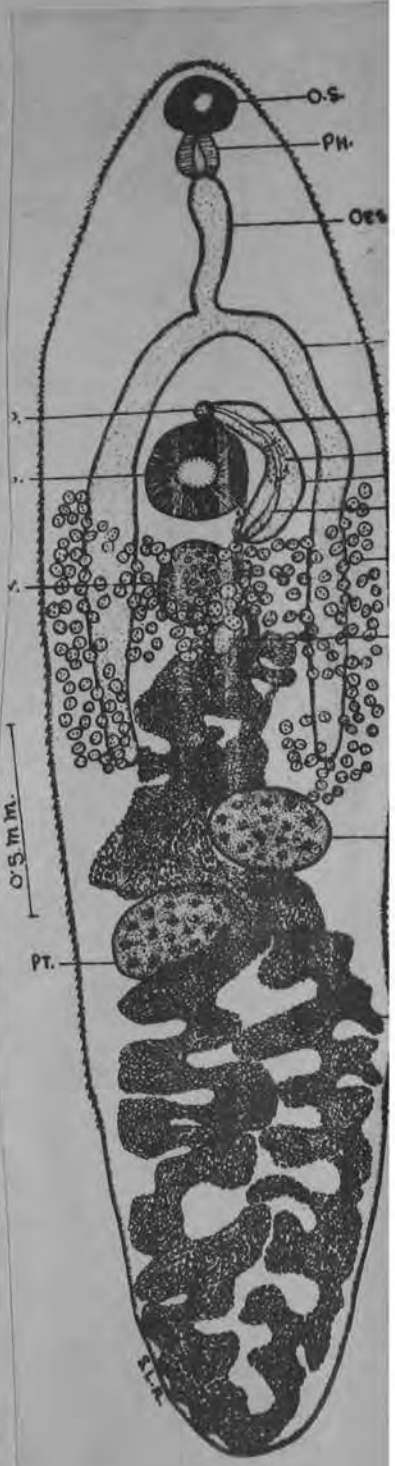


Fig. 2.

Tremiorchis vitelloconfluentum n.sp. Dors

TABLE

Showing the comparison of the two new species

		T. mehrai	*T. vitelloconfluentum*
1.	Study based on	12 Parasites.	3 Parasites.
2.	Host	*Bufo melanostictus* Schneid.	*Rana tigrina* Daud.
3.	Locality	Ghamapur, Jabalpur.	Piparia, 111 miles from Jabalpur.
4.	Extension of Body spines	Extend from the anterior end of the body to 2/3 of the body.	Extend from the anterior end of the body to 3/4 of the body.
5.	Body size	5·25–5·79 × 1·37–1·48 mm.	2·398–4·05 × 0·656–1 mm.
6.	Oral sucker	Oral sucker larger than the ventral sucker.	Oral sucker smaller than the ventral sucker.
7.	Prepharynx	Very small.	Small.
8.	Pharynx	0·157–0·189 × 0·178–0·189 mm.	0·102–0·11 × 0·055–0·094 mm.
9.	Oesophagus	0·473–0·867 × 0·063–0·09, mm.	0·331–0·347 × 0·055–0·091 mm.
10.	Shape and position of ovary	Oval to spherical, submedian.	Oval, median.
11.	Nature and extension of vitelline follicles	Follicles arranged in groups ; extends from the anterior level of ventral sucker to the level of the equator of the anteiror testis.	Follicles not arranged in groups ; extends from the middle of the ventral sucker to the anterior level of the anterior testis.
12.	Extension of excretory bladder	Stem of excretory bladder extends to the posterior border of the ovary.	Stem of excretory bladder extends to the posterior end of anterior testis.

The two new species, *T. mehrai* and *T. vitelloconfluentum* differ from one another in the size of their body, general body spination, size of the suckers, position of ovary, extension and nature of vitelline follicles, and in the extension of excretory bladder and justifies their creation.

KEY TO THE VALID SPECIES OF THE GENUS TREMIORCHIS MEHRA AND NEGI, 1926.

I. Oral sucker smaller than the ventral sucker.

II. Oral sucker larger than the ventral sucker.

I. (1) Vitelline follicles extend from middle of ventral sucker to the anterior level of anterior testis ; follicles not arranged in distinct groups, follicles confluent in the ovarian region. *T. vitelloconfluentum* n.sp.

(2) Vitelline follicles extend from intestinal bifurcation to the ends of intestinal caeca, arranged in groups, and not confluent in the ovarian region. *T. ranarum* Mehra and Negi, 1926. (Syn. *Genarovitus pentadelphi* Bhalerao, 1926.)

II. (3) Vitelline follicles extend from the level of intestinal bifurcation to ends of intestinal caeca, follicles not arranged in groups, and not confluent. Testes oblique. *T. varanum* Verma, 1930.

(4) Vitelline follicles extend from anterior level of ventral sucker to middle of anterior testis ; follicles arranged in groups, follicles not confluent. Testes oblique. *T. mehrai* n.sp

TREMIORCHIS

LOOSE LEAF
ORGANIZER

SCHEDULE

PERIOD OR TIME								
COURSE **MON.** INSTRUCTOR								
COURSE **TUE.** INSTRUCTOR								
COURSE **WED.** INSTRUCTOR								
COURSE **THU.** INSTRUCTOR								
COURSE **FRI.** INSTRUCTOR								
COURSE **SAT.** INSTRUCTOR								

NAME _____

ADDRESS _____

SCHOOL _____ TELEPHONE _____

Walliniinae n. subfam.

Subfamily diagnosis. — Allocreadiidae: Body plump to elongate, spinose or not. Acetabulum in anterior half of body. Ceca terminating at or short of posterior extremity. Testes tandem or diagonal, rarely symmetrical, in posterior half or middle third of body. Cirrus pouch enclosing seminal vesicle, prostatic complex and cirrus, may or may not extend posterior to acetabulum. Genital pore median or nearly so, anterior to acetabulum. Ovary median or submedian, overlapping acetabulum, or more frequently postacetabular. Vitellaria extending in lateral fields to variable extent. Uterus winding backward as far as or to near posterior extremity. Excretory vesicle tubular or elongate saccular.

Key to genera of Walliniinae

1. Body plump; testes symmetrical; ovary lobate, overlapping acetabulum ..... *Vietosoma*
   Body elongate; testes tandem or somewhat diagonal; ovary unlobed, posterior to acetabulum 2
2. Cuticle coarsely or heavily spined, vitellaria commencing at level of acetabulum, or posterior to it; cirrus pouch overlapping or surpassing acetabulum 3
   Cuticle not spined; vitellaria commencing at level of acetabulum or anterior to it; cirrus pouch smaller 4
   Cuticle spinose; vitellaria commencing at level of intestinal bifurcation; cirrus pouch extending back of acetabulum ..... *Gauhatiana*
3. Receptaculum seminis present; oral sucker larger than acetabulum, with spines larger than body spines; vitellaria extending from behind acetabulum to well beyond posterior testis ..... *Paramacroderoides*
   Receptaculum seminis absent; oral sucker smaller than acetabulum, without spines larger than body spines; vitellaria commencing behind acetabulum ..... *Macroderoides*
   Receptaculum seminis absent(?); oral sucker equal to acetabulum, without spines larger than body spines; cirrus pouch enormous; vitellaria commencing at level of acetabulum ..... *Parastiotrema*
4. Receptaculum seminis present; ovary median; vitellaria extending from level of intestinal bifurcation to posterior extremity; testes not separated by uterine coils ... *Macrolecithus*
   Receptaculum seminis absent(?); ovary submedian; vitellaria less extensive; testes separated by uterine coils ..... *Wallinia*

Wallinia Pearse, 1920

Generic diagnosis. — Allocreadiidae, Walliniinae: Body elongate, unarmed. Oral sucker subterminal, large; pharynx well developed; esophagus very short; ceca terminating short of posterior extremity. Acetabulum larger than oral sucker, in anterior half of body. Testes a little obliquely tandem, postequatorial. Cirrus pouch small. Genital pore pre-acetabular, median. Ovary submedian, between acetabulum and anterior testis. Uterus passing between two testes and reaching to posterior extremity. Vitellaria lateral to anterior portion of intestine, for most part from acetabular level to anterior testis. Excretory vesicle? Parasitic in intestine of ~~marine~~ freshwater fishes.

Genotype: *W. valenciae* Pearse, 1920 (Pl. 9, Fig. 108), in *Gephyrocharax valenciae;* S. America.

Plagiorchidae

Genus *Wallinia*, new Pearse, 1920

Plagiorchiidae with the genital pore median and immediately anterior to acetabulum; vitellaria small and largely confined to the lateral regions of the second quarter of the body; acetabulum one-fourth to one-third greater in diameter than the oral sucker, situated close behind the bifurcation of the intestinal rami; ovary globular, small, on the left side behind the acetabulum; testes rounded, arranged one behind the other in the third quarter of the body, the posterior one somewhat to the left of the median line. Named for Dr. Ivan E. Wallin.

This genus differs from *Pneumonoeces* in the position of the genital opening, the size and position of the acetabulum, and from *Plagiorchis* in the arrangement of vitellaria, acetabulum, testes, and other features. Type species—*Wallinia valenciae*.

Wallinia valenciae, new species Pearse, 1920

Length, 1.34 mm. (contracted); width, .38; body widest in region of acetabulum, constricted behind the oral sucker (Fig. 6). Diameter of acetabulum about one-fifth the length of the body; diameter oral sucker about two thirds that of acetabulum. Genital field occupies the posterior three-fourths of the body. The small spherical ovary lies somewhat behind the acetabulum on the left side. The testes are rounded; the anterior one lies slightly behind the ovary near the median line; the posterior testis is on the left side of the body, extending to the middle of the intestinal ramus on that side. The uterus is coiled in the posterior three-fourths of the body; the loops are slender and filled with eggs. Size of eggs, .041 by .02 mm.

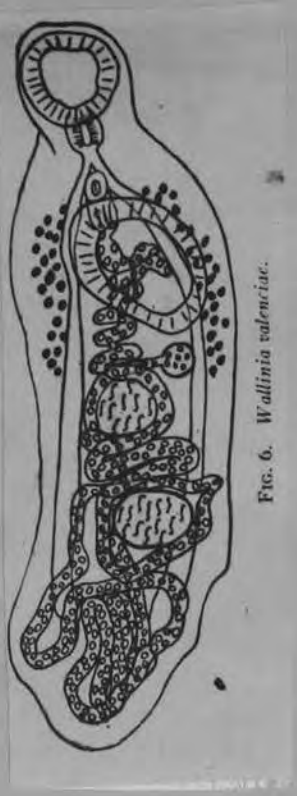


FIG. 6. *Wallinia valenciae.*

The vitellaria are small and lie outside the intestinal rami in the second quarter of the body. The genital pore is crowded into the triangular space between the anterior margin of the acetabulum and the intestinal rami.

Host: *Gephyrocharax valenciae* Eigenmann, in intestine.

Type, Cat. No. 7569 (Helm. Coll. U. S. N. M); collected from a fish taken in Lake Valencia at Maracay, in shallow water among rushes, July 24, 1918.

The following species is placed in the genus *Allocreadium* Looss, although it appears to differ from other members of that genus in possessing a shorter esophagus and in the position of the genital aperture immediately anterior to the acetabulum.

placed in Allocreadiidae
by Yamaguti, 1953.

WALLINIA

Westella, n. g. Artigas, Ruiz, & Leao, 1942

Diagnose genérica:

Plagiorchiidae: Corpo espatulado, com maior largura na metade posterior do corpo. Cutícula revestida de espinhos. Ventosas quasi iguais; acetábulo pre-equatorial. Esôfago curto. Cecos atingindo o terço posterior do corpo. Testículos lisos ou sub-lobados, post-equatoriais, com campos afastados e zonas parcialmente coincidentes. Bolsa do cirro muito desenvolvida, recurvada para baixo, com uma parte basal muito dilatada; contem vesícula seminal enovelada, longo *ductus* e um cirro tubular e inerme. Poro genital post-acetabular, pre-equatorial, lateral à linha mediana do corpo. Ovário liso, menor do que os testículos, equatorial e oposto ao poro genital. Vagina tubular, musculosa, recurvada externamente sôbre o ramo descendente da bolsa do cirro. Útero composto por um ramo descendente fino e sinuoso que atinge a extremidade posterior do corpo, e de outro ascendente, muito calibroso, que passa entre os testículos, forma várias curvas e atinge a região acetabular. Vitelinos na maioria intra-cecais e dispostos em dois campos, mais ou menos distintos, que se estendem da zona ovariana à post-testicular; são formados por cachos de ácinos volumosos. Receptáculo seminal e glândula de Mehlis presentes. Parasito do esôfago e cavidade bucal de ofídios.

Espécie tipo: *Westella sulina*, n. sp.

Êste gênero é próximo de *Opisthogonimus* LÜHE, 1900, dele se distinguindo, principalmente, pela forma do corpo e pela posição do poro genital.

Westella Artigas, Ruiz et Leão, 1943

Generic diagnosis .— Plagiorchiidae, Opisthogoniminae: Body spatulate, spinose. Oral sucker subterminal, prepharynx distinct, esophagus short. Ceca terminating short of posterior extremity. Acetabulum nearly as large as oral sucker, pre-equatorial. Testes entire or indented, post-equatorial, subsymmetrical. Cirrus pouch large, extending transversely behind acetabulum; seminal vesicle winding at curved base of cirrus pouch. Cirrus unarmed. Genital pore submedian, postacetabular. Ovary rounded, small, posterior to base of cirrus pouch, medial to cecum, opposite genital pore. Receptaculum seminis present. Vitellaria forming bunches mainly medial to ceca, extending in two distinct fields from ovarian zone to posttesticular level. Uterus reaching to posterior extremity, its ascending portion strongly distended, passing between two testes; metraterm well differentiated; eggs small. Excretory vesicle? Parasitic in buccal cavity and esophagus of snakes.

Genotype: *W. sulina* Artigas, Ruiz et Leão, 1942 (Pl. 60, Fig. 726), in *Philodryas schottii*, Brazil.

CLAVE DE LAS ESPECIES DEL GENERO *Westella* ARTIGAS, RUIZ y LEÃO, 1942

1.	Bolsa del cirro grande, mayor al doble del diámetro del acetábulo, de posición transversal	*W. sulina*
2.	Bolsa del cirro pequeña	3
3.	Vitelógenos intracecales y cecales	*W. serpentis*
	Vitelógenos cecales y extracecales	*W. philodryadum*

FROM MAÑÉ-GARZÓN AND GORTARI, 1965

Westella, n. g.

Artigas, Ruiz & Leão, 1942 Mem. Inst. Butantan

Diagnose genérica:

Plagiorchiidae: Corpo espatulado, com maior largura na metade posterior do corpo. Cuticula revestida de espinhos. Ventosas quasi iguais; acetábulo pre-equatorial. Esôfago curto. Cecos atingindo o terço posterior do corpo. Testículos lisos ou sub-lobados, post-equatoriais, com campos afastados e zonas parcialmente coincidentes. Bolsa do cirro muito desenvolvida, recurvada para baixo, com uma parte basal muito dilatada; contem vesícula seminal enovelada, longo *ductus* e um cirro tubular e inerme. Poro genital post-acetabular, pre-equatorial, lateral à linha mediana do corpo. Ovário liso, menor do que os testículos, equatorial e oposto ao poro genital. Vagina tubular, musculosa, recurvada externamente sôbre o ramo descendente da bolsa do cirro. Útero composto por um ramo descendente fino e sinuoso que atinge a extremidade posterior do corpo, e de outro ascendente, muito calibroso, que passa entre os testículos, forma várias curvas e atinge a região acetabular. Vitelinos na maioria intra-cecais e dispostos em dois campos, mais ou menos distintos, que se estendem da zona ovariana à post-testicular; são formados por cachos de ácinos volumosos. Receptáculo seminal e glândula de Mehlis presentes. Parasito do esôfago e cavidade bucal de ofídios.

Espécie tipo: *Westella sulina*, n. sp.

Este gênero é próximo de *Opisthogonimus* LÜHE, 1900, dele se distinguindo, principalmente, pela forma do corpo e pela posição do poro genital.

Testella avilina Artigas, Ruiz & Leão, 1942
Genotype of Genus Testella
(Figs. 4 e 5)

Diagnose especifica:

Westella: Corpo de tamanho médio, espatulado, com o terço anterior mais delgado; comprimento de 6,93 a 7,53mm. Largura ao nivel do acetábulo variando entre 1,33 e 1,91mm. Cutícula revestida de espinhos dispostos em filas transversais, mais ou menos densos no terço anterior do corpo e faltando nas extremidades. Ventosa oral sub-terminal, voltada para a face ventral, circular, medindo 0,424 a 0,692mm de diâmetro. Acetábulo circular, imediatamente superior à linha divisória dos terços médio e superior, medindo 0,537 a 0,636mm de diâmetro. Distância entre as ventosas variando de 1,908 a 2,403mm. Distância da bifurcação cecal ao acetábulo de 1,272 a 1,626mm. Pre-faringe com cêrca de 0,150mm. Faringe musculoso, trapezóide, medindo 0,141 a 0,183mm de comprimento por 0,183 a 0,240mm de largura. Esôfago curto com 0,169 a 0,282mm de comprimento. Cecos sub-iguais, distando de 0,848 a 1,484mm da extremidade posterior do corpo. Testículos sub-iguais, arredondados ou ligeiramente lobados, imediatamente post-equatoriais, intra-cecais e cecais, com campos muito afastados e zonas parcialmente coincidentes, medindo 0,449 a 0,820mm de comprimento por 0,353 a 0,452mm de largura; testículo anterior com campo coincidente com o poro genital; testículo posterior com campo coincidente com o ovário. Vasos eferentes unindo-se na base da bolsa do cirro. Esta é um órgão muito desenvolvido, apresenta uma parte basal dilatada, situando-se do lado ovariano, da qual se origina um ramo mais delgado que se dirige para o lado oposto, traçando em seu percurso uma curva em forma de U voltado para baixo e terminando próximo à linha cecal, onde se situa o poro genital; contem uma vesícula seminal tubular e mais ou menos enovelada, que ocupa cêrca de um quarto do comprimento total da bolsa, segue-lhe um longo *ductus* que se continua por um cirro medianamente calibroso e inerme. Mede a bolsa do cirro 1,696 a 2,191mm de comprimento por uma largura máxima de 0,166 a 0,339mm. Ovário ovalado, liso, post-acetabular, pre-testicular, medindo cêrca de 0,353mm de comprimento por 0,254mm de largura. O útero é extremamente caraterístico: apresenta um ramo fino que, descendo por um dos lados, forma numerosas circunvoluções na parte posterior do corpo, ascendendo pelo lado oposto; a uma certa altura o ramo ascendente avoluma-se bruscamente e, formando três ou quatro curvas, insinua-se entre os testículos, atinge a zona acetabular e dirige-se para o lado terminando ao nivel da vagina. Êste órgão é tubular, muito volumoso e rodeado por células glandulares, recurvado sôbre o ramo descendente da bolsa do cirro; mede cêrca de 0,777mm de comprimento por cêrca de 0,197mm de largura. Receptáculo seminal ovalado, para-ovariano, medindo 0,183 a 0,452mm de comprimento por 0,141 a 0,311mm de largura. Glândula de Mehlis entre o receptáculo

seminal e o ovário. Vitelinos dorsais, intra-cecais e cecais, divididos em dois campos mais ou menos distintos, formados por numerosos cachos de ácinos volumosos que se estendem desde a zona ovariana até a região post-testicular, pouco além da linha que divide os terços médio e posterior. Ovos numerosos, ovais, de casca delgada, operculados, medindo 0,018 a 0,028mm de comprimento por 0,011 a 0,017mm de largura.

Hospedeiro tipo: *Philodryas schottii* (Schlegel). Nome vulgar: "Parelheira".

Localização: Cavidade bucal e esôfago.

Localidade tipo: Tuparaí — Rio Grande do Sul — Brasil.

A descrição e medidas apresentadas para a presente espécie foram baseadas em seis espécimes comprimidos e montados, fichados sob o No. 5.316 e depositados na coleção de Parasitologia do Instituto Butantan.

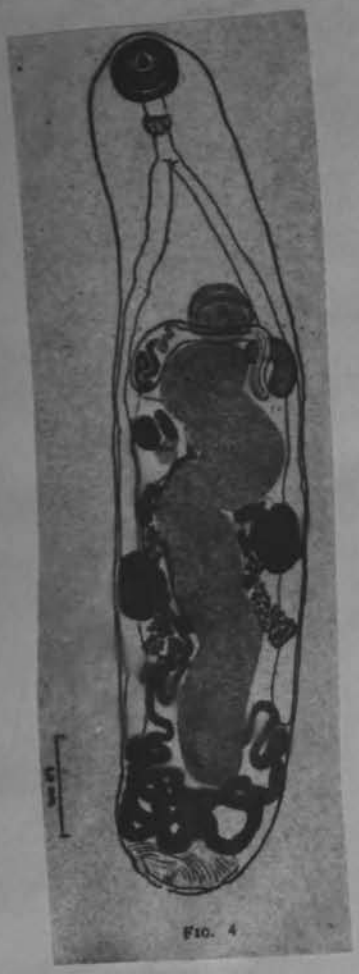


Fig. 4

Fig. 5

Westella ruiina, n. g., n. sp. — Pormenor da bolsa do cirro.

Westella sulina Artigas, Ruiz y Leão, 1942

(Figura 5)

El cuerpo es de forma subcilíndrica, con el extremo anterior más ensanchado que el posterior. Mide 3.14 mm. a 5.07 mm. de largo. El ancho máximo está situado a nivel o algo por encima del acetábulo, donde mide 1.33 mm. a 1.55 mm. La cutícula está provista de espinas de pequeño tamaño, cuya densidad disminuye hacia los extremos del cuerpo. El acetábulo es de situación preecuatorial, mediano, subcircular, de diámetro que varía entre 0.27 mm. a 0.58 mm. La distancia entre el borde anterior del acetábulo al extremo anterior del cuerpo varía entre 0.77 mm. a 1.85 mm.

La ventosa oral es subterminal, mide 0.29 mm. a 0.57 mm. de diámetro. Prefaringe pequeña. Faringe musculosa, con un ancho comprendido entre 0.16 mm. a 0.31 mm. y una longitud que varía entre 0.13 mm. a 0.27 mm. El esófago es corto, mide de largo entre 0.05 mm. y 0.15 mm. Los ciegos intestinales son subiguales, ligeramente lobulados, cuyos extremos terminales se encuentran a una distancia que varía de 0.33 mm. a 1.29 mm. del extremo posterior del cuerpo.

Los testículos son subiguales, redondeados, situados en la mitad posterior del cuerpo, juxtaecuatoriales, ocupando zonas cecales e intracecales, ambos en el mismo nivel, o en algunos ejemplares el izquierdo más anterior que el derecho. El testículo izquierdo mide 0.24 mm. a 0.37 mm. de largo por 0.24 mm. a 0.44 mm. de ancho; el testículo derecho mide 0.24 mm. a 0.37 mm. de largo por 0.24 mm. a 0.31 mm. de ancho. La bolsa del cirro está muy desarrollada, de situación discretamente preecuatorial; consta de una porción basal, ensanchada, situada directamente por delante y por fuera del ovario y otra de forma tubular que se dirige transversalmente de derecha a izquierda, en íntima relación con el borde posterior del acetábulo, para terminar encurvándose hacia abajo en el poro genital, situado este último al mismo nivel que la bolsa del cirro, juxtacetabular y a la izquierda de la línea media. En su interior la bolsa del cirro contiene una vesícula seminal que forma varios bucles y que ocupa la porción basal de dicha bolsa; se continúa luego con un largo ducto y luego por el cirro. La bolsa del cirro mide en su totalidad 0.67 mm. a 1.04 mm. de largo; su porción basal mide 0.20 mm. a 0.58 mm. de largo y 0.15 mm. a 0.43 mm. de ancho; su porción tubular mide 0.46 mm. a 0.86 mm. de largo.

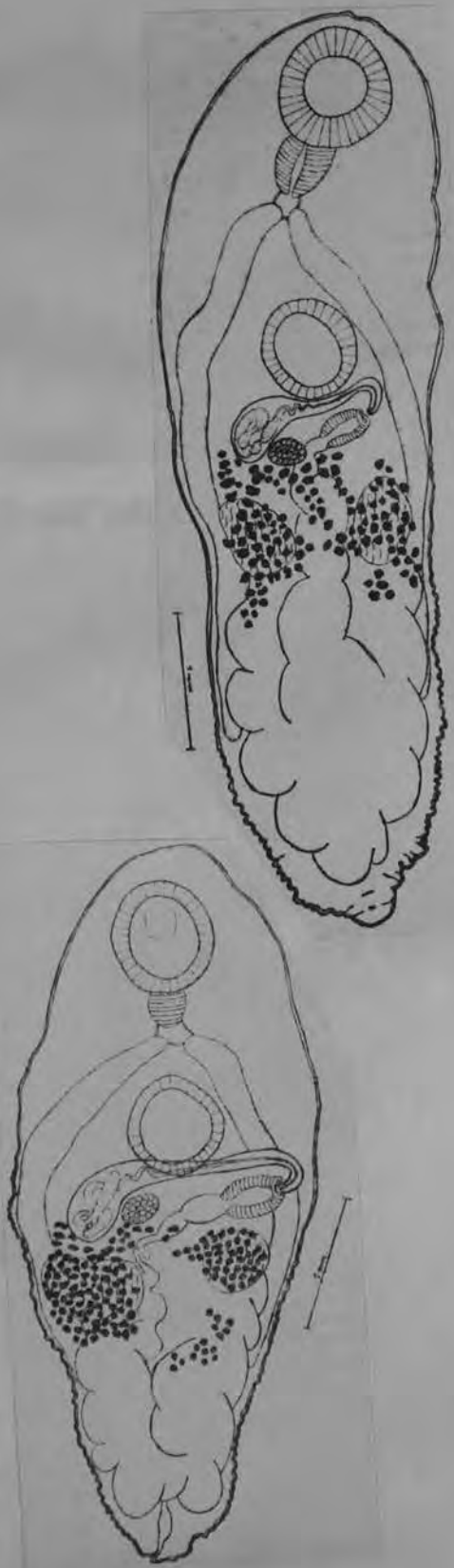
El ovario está situado en la zona ecuatorial derecha del cuerpo, postacetabular y pretesticular; es de forma ovoidea y mide 0.10 mm. a 0.23 mm. de largo por 0.11 mm. a 0.16 mm. de ancho. Glándula de Mehlis presente. El útero consta de una rama descendente que pasa entre ambos testículos formando luego, en la porción postesticular del cuerpo, numerosas ansas, que llenan íntegramente dicha zona; asciende luego por el lado izquierdo del cuerpo, dando lugar en su extremidad distal a la formación de una vagina o metratermo; es éste un órgano muy musculoso de paredes gruesas rodeado de células glandulares, que mide 0.18 mm. a 0.33 mm. de largo por 0.11 mm. a 0.27 mm. de ancho. Los vitelógenos ocupan una posición dorsal, de situación cecal e intracecal, en campos difícilmente delineables, cuya extensión se encuentra comprendida entre la zona ovárica y la testicular, aunque descienden algo por debajo de esta última zona.

Los huevos son de color castaño claro, operculados. Miden 0.023 mm. a 0.026 mm. de largo por 0.008 mm. a 0.014 mm. de ancho.

Habitat: Cavidad bucal de *Philodryas schotti* (Schlegel, 1837).

Procedencia: Nico Pérez, Dto. de Lavalleja, Uruguay. 15 ejemplares depositados en la colección helmintológica del Museo Nacional de Historia Natural de Montevideo.

Discusión: Esta especie fue descrita en 1942 por Artigas, Ruiz y Leão, de ejemplares procedentes de la misma especie de culebra, *Philodryas schotti* (Schlegel) procedentes del Estado de Río Grande del Sur, Brasil, y para la cual dichos autores crearon el género *Westella*, dentro de la familia Plagiorchiidae Ward, 1917, subfamilia



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Opisthogoninae TRAVASSOS, 1928. Nuestros ejemplares coinciden casi completamente con la descripción original de ARTIGAS, RUIZ y LEÃO, 1942, única existente hasta el momento. Posteriormente, los mismos autores, en 1943, luego de un importante y útil análisis sobre la sistemática del género *Opisthogonimus* LÜHE, 1900, consideran el género *Westella* por ellos creado como subgénero del género *Opisthogonimus* LÜHE, 1900, basándose en la revisión de las descripciones de *Opisthogonimus philodryadum* WEST, 1896, y de otra especie encontrada por ellos, *O. (Westella) serpentis* ARTIGAS y LEÃO, 1943. Con dichas tres especies crean el subgénero *Westella*, caracterizado por ser *Opisthogonimus* con poro genital situado fuera de la línea media y en la zona ovárica. Expresan luego: "A nosso ver, êste caracteristico la situação para-mediana e alta do poro genital é um elemento que justifica plenamente a distinção de todas as espécies de Opisthogonimus em dois tipos morfológicos, com o valor de gênero ou de sub-gênero".

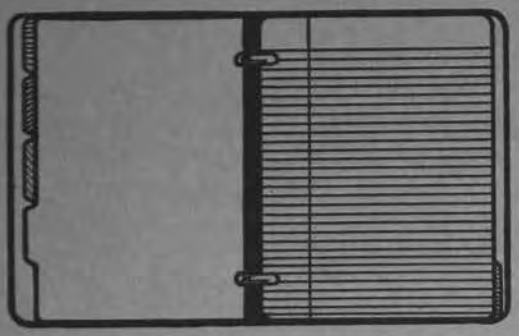
YAMAGUTI (1958) sin embargo conserva el género *Westella*, fundamentalmente basado en la posición transversal de la bolsa del cirro, con una sola especie, *W. sulina* ARTIGAS y LEÃO, 1942.

Sin pretender querer derimir definitivamente esta cuestión, donde se entraría en la discusión previa de lo que es un subgénero (pensamos que "subgénero" tiene un valor más bien práctico y no conceptual), nos decidimos a conservar la validez del género *Westella*, hasta tanto argumentos más contundentes aboguen en otro sentido.

FROM MAÑÉ-GARZÓN AND GORTARI, 1965

WESTELLA

LOOSE LEAF INDEX



RABLE INDEX
VIDERS, SUITABLE
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IDEAL FOR CLASS-IFYING, OR SEPARATING STUDIES, VARIOUS SUBJECTS OR MISCELLANEOUS DATA.

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SUBJECTS

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CLASS SCHEDULE

PERIOD		FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SEVENTH	EIGHTH
DAY	COURSE								
	INSTRUCTOR								
SDAY	COURSE								
	INSTRUCTOR								
NESDAY	COURSE								
	INSTRUCTOR								
RSDAY	COURSE								
	INSTRUCTOR								
AY	COURSE								
	INSTRUCTOR								
URDAY	COURSE								
	INSTRUCTOR								

Xenopharynx Nicoll, 1912

Generic diagnosis. — Plagiorchiidae, Plagiorchiinae: Body flattened elliptical. Acetabulum comparatively small, in anterior third of body. Oral sucker ventroterminal, nearly as large as acetabulum. Pharynx lobed in front. Esophagus short. Ceca terminating at or near posterior extremity. Testes diagonal, in middle third of body. Cirrus pouch small, pre-acetabular. Genital pore bifurcal. Ovary a little behind acetabulum, submedian or practically median. Receptaculum seminis present. Vitellaria in lateral fields of forebody as well as of greater anterior part of hindbody. Uterus extending back of testes but not so far as posterior extremity, may overreach ceca laterally; eggs small, numerous. Excretory vesicle with long stem and short arms. Parasitic in gall bladder of snakes.

Genotype: *X. sola* Nicoll, 1912 (Pl. 49, Fig. 601), in *Naja tripudians*, *N. bungarus;* India. Also in *Naja nivea;* S. Africa. (Nicoll mistook the posterior testis for the ovary, cf. Khalil).

Other species: *X. piscator* Bhalerao, 1926, in *Tropidonotus piscator;* Rangoon. For additional species see p. 558.

Plagiorchiae

XENOPHARYNX Nicoll 1912

Removed by Khalil from the Dicrocoeliidae to the Telorchinae, and redefined as follows:

Body elongate and flattened, cuticle without spines. Acetabular aperture midventral pre-equatorial. Genital pore pre-acetabular. Oral sucker larger than acetabulum. Pharynx prsent, ceca simple, long. Testes diagonal, intercecal, surface with infoldings. Post-ovarian. Ovary intercecal, in uterine zone, post-acetabular, pretesticular. Uterus with descending and ascending limb, intercecal. Vitellaria extracaecal, limited to the anterior half of the body. Excretory bladder, roomy, long, Y-shaped.

Type species: Xenopharynx solus Nicoll 1912 from Indian cobra.

X. piscator Bhalerao, 1926

XENOPHARYNX

BHALEROPHARYNX Skrjabin et Antipin, 1958
type species: B. piscator (Bhalerao, 1926) S. & A., 1958
also: B. biliphaga (Srivastava, 1954) S. & A., 1958

Nicoll originally described the ovary posterior to the testes in Xenopharynx. Khalil (1923) followed by Yamaguti (1958) and Chatterji and Kruidenier (1961) believed that the ovary of the type specimen had been misidentified as its anterior testis.

The Russians, adhering to the original description, named the new genus Bhaleropharynx for species other than the type of Xenopharynx.

XENOPHARYNX Nicoll 1912

Removed by Khalil from the Dicrocoeliidae to the Telorchinae, and redefined as follows:

Body elongate and flattened, cuticle without spines. Acetabular aperture midventral pre-equatorial. Genital pore pre-acetabular. Oral sucker larger than acetabulum. Pharynx prsent, ceca simple, long. Testes diagonal, intercecal, surface with infoldings. Post-ovarian. Ovary intercecal, in uterine zone, post-acetabular, pretesticular. Uterus with descending and ascending limb, intercecal. Vitellaria extracaecal, limited to the anterior half of the body. Excretory bladder, roomy, long, Y-shaped.

Type species: Xenopharynx solus Nicoll 1912
from Indian cobra.

X. piscator Bhalerao, 1926

During the course of this study, it was noted also that Khalil (1923) ignored important differences when he described a specimen, which he recovered from the same host and habitat as the type (gall bladder: *Naja bungarus* Schlegel, 1837 = *Hamadryas hannah* Cantor, 1836), as conspecific with the type of the genus *X. solus* Nicoll, 1912 (synonym: *X. sola* E. Yamaguti, 1958). It is also apparent that Khalil's specimen cannot be placed in the Plagiorchiidae with *Xenopharynx* but its reassignment should await future recovery and study of similar specimens.

From: Chatterji & Kruidenier 1961

The X solus of Khalil, 1923 is transferred to a new genus Neopisthorchis, to become N. solus (Khalil, 1923) Chatterji & Kruidenier, 1961 — family Opisthorchiidae.

Xenopharynx NICOLL (1912)

The genus *Xenopharynx* was established by NICOLL in 1912 for his fluke *Xenopharynx solus* which he had collected from the gall bladder of an Indian cobra *Naja tripudians*. His description was based on a solitary specimen and there existed some confusion with regard to the identity of the gonads until 1923 when KHALIL redescribed the parasite. His account also was based on a single specimen collected by him from the same host. He pointed out what NICOLL had considered to be the right testis was actually the ovary, and the ovary described by him was the posterior testis. Further as a result of his study he transferred the genus from the Dicrocaeliidae, under which it had been originally included by NICOLL, to Telorchinae, Looss, 1899. Subsequently, MEHRA (1931) reviewing the subfamilies of Plagiorchidae LÜHE, 1901, placed the genus in Reniferinae PRATT, 1903, a scheme with which the writer is in complete agreement. Besides the type species the only other species known is *Xenopharynx piscator* BHALERAO, 1926, parasitic in *Tropidonotus piscator*.

The writer collected in Hyderabad material belonging to one known and two new species of the genus which are described here.

FROM SIMHA, 1958

In the light of our present knowledge of the species, the generic diagnosis of *Xenopharynx* Nicoll, 1912, is emended as follows :

Genus *Xenopharynx* Nicoll, 1932 : Khalil, 1923 : emended.

Reniferidae : *Reniferinae*. Body elongate-oval, of moderate size. Cuticle smooth or spiny. Suckers equal or unequal. Prepharynx present or absent. Pharynx contains an invaginated portion of oesophagus. Oesophagus short. Intestinal caeca long, of variable width, extending upto the end of the body. Gonads postacetabular, confined to the middle third of body. Testes entire, diagonal, postovarian. Cirrus-sac small, situated in front of the ventral sucker and contains a folded vesicula seminalis, pars prostatica and ductus ejaculatorius. Genital pore ventral to oesophageal bifurcation. Ovary pretesticular and postacetabular. Uterus with ascending and descending limbs, passing posteriorly between the testes and may extend upto the posterior region of the body. Vitellaria well-developed extending from the sides of the oral sucker upto the level of the posterior testis or a little beyond the latter. They tend to merge together in the anterior region of the body. Receptaculum seminis and Laurer's canal present. Eggs numerous. Excretory vesicle Y-shaped with a long median stem and two short anterior limbs, or T-shaped with a long medain stem and a short transverse limb which divides on each side into on anterior and a posterior branch. Parasites of gall bladder of Ophidia.

Genotype : *Xenopharynx solus* Nicoll, 1912.

Key to the species of the genus *Xenopharynx* Nicoll, 1912.

I. Body spinose. Ovary smaller than testes.
Intestinal caeca extremely wide.....*X. indica* sp. now.
Body aspinose. Ovary larger than testes.
Intestinal caeca narrow.....II.

II. Oral sucker larger than ventral sucker.....*X. solus* Nicoll, 1912.
Oral sucker smaller than ventral sucker.....*X. piscator* Bhalerao, 1926.

Systematic position of the genus *Xenopharynx* Nicoll, 1912.

Byrd and Denton (1938) while discussing the systematics of the various genera assigned to the subfamily *Reniferinae* Pratt, excluded the genus *Xenopharynx* from this subfamily on the ground that it possesses a receptaculum seminis.

The present writer, however, does not agree with Byrd and Denton (1938) in excluding the genus *Xenopharynx* from the subfamily *Reniferinae* on account of the presence of a receptaculum seminis which is not a character of subfamily importance. The genus *Xenopharynx* should, therefore, be retained in the subfamily *Reniferinae* to which it was assigned by Mehra (1931). Its position under the subfamily *Reniferinae* is justified by its close resemblance to such typical genus as *Dasymetra* Nicoll, 1911, from which it chiefly differs in having a receptaculum seminis.

FROM BAUGH, 1956

KEY TO THE SPECIES OF THE GENUS *XENOPHARYNX* NICOLL, 1912

1. Testes anterior to ovary ..... *X. solus* Nicoll, 1912
   Testes posterior to ovary 2
2. Ventral sucker smaller than oral sucker ..... *X. biliphaga* Srivastava, 1954
   Ventral sucker larger than oral sucker 3
3. Posterior extent of vitellaria up to level of testes; testes in third quarter of body ..... *X. pyriformis* Simha, 1958
   Posterior extent of vitellaria behind posterior testes up to of uterine coil; testes in posterior half of body ..... *X. piscator* Bhalerao, 1926

Morphological Variations in *Xenopharynx solus* Nicoll, 1912 and Their Bearing on the Systematics of the Genus *Xenopharynx* Nicoll, 1912 (Trematoda : Plagiorchiidae)

S. L. Rai,* M.Sc., and S. M. Agarwal,† M.Sc. (1963)

ABSTRACT

Xenopharynx solus is redescribed from 118 specimens from the gall bladder of *Tropidonotus piscator*. Morphological variations invalidate, as synonyms of *X. solus*: *X. orientalis*, *X. nicolli*, *X. mehrai*, *X. raipurensis*, *X. piscator*, *X. heterovitellatus*, *X. hirakudensis*, and *X. sambalus*. Accepted as valid species, besides *X. solus*, are *X. pyriformis*, *X. biliphaga*, and *X. dhamini*.

The genus *Xenopharynx* was erected by Nicoll (1912) to include the type species, *X. solus*, a trematode that has lobed pharynx and occurs in the gall bladder of snakes. Khalil (1923) redescribed *X. solus*. Chatterji et al. (1961) opined that Khalil misinterpreted his specimen and they referred it to *Xenopisthorchis solus* (Khalil, 1923) Chatterji et al., 1961, family Opisthorchiidae. Subsequently described species are: *X. piscator* Bhalerao, 1926, from *Tropidonotus piscator*; *X. amudariensis* Strom, 1928 (= *Ophiorchis amudariensis* [Strom] Mehra, 1937), from *T. tessellatus*; *X. biliphaga* Srivastava, 1956, from *T. piscator*; *X. indica* Baugh, 1956, from "a colubrid snake"; *X. pyriformis* Simha, 1957, from *Ptyas* (*Zamenis*) *mucosus*; *X. heterovitellatus* Simha, 1957, from *T. piscator*; *X. orientalis*, *X. mehrai*, *X. nicolli*, and *X. raipurensis*, all described from *T. piscator* by Tiwari (1959); *X. hirakudensis*, *X. sambalus*, from *Naja naja* and *X. dhamini*, from *Ptyas mucosus*, all described by Chatterji et al. (1961).

Arora and Agarwal (1960) observed morphological variations in 157 specimens of *Paradistomum orientalis* to an extent that stressed the significance of population studies in helminth systematics. In 118 *Xenopharynx solus* from *Tropidonotus piscator*, the authors have found similar variations that invalidate several names proposed for trematodes from that host. Eleven of 15 *T. piscator* from the Gangasagar and Supatal tank localities of Jabalpur harbored from 1 to 30 parasites each. Four hosts yielded both mature and immature worms while those from the remaining snakes were either mature or immature. All specimens were prepared as whole mounts except 18 immature ones from one snake; they were sectioned. Fixatives included aqueous and alcoholic Bouin's fluid, 10% formalin, and 70% alcohol. Following alcohol or formalin fixation, the vitelline system of some specimens was stained selectively by the catechol technique of Johri and Smyth (1956). Whole mounts were stained in acid carmine or Gower's carmine.

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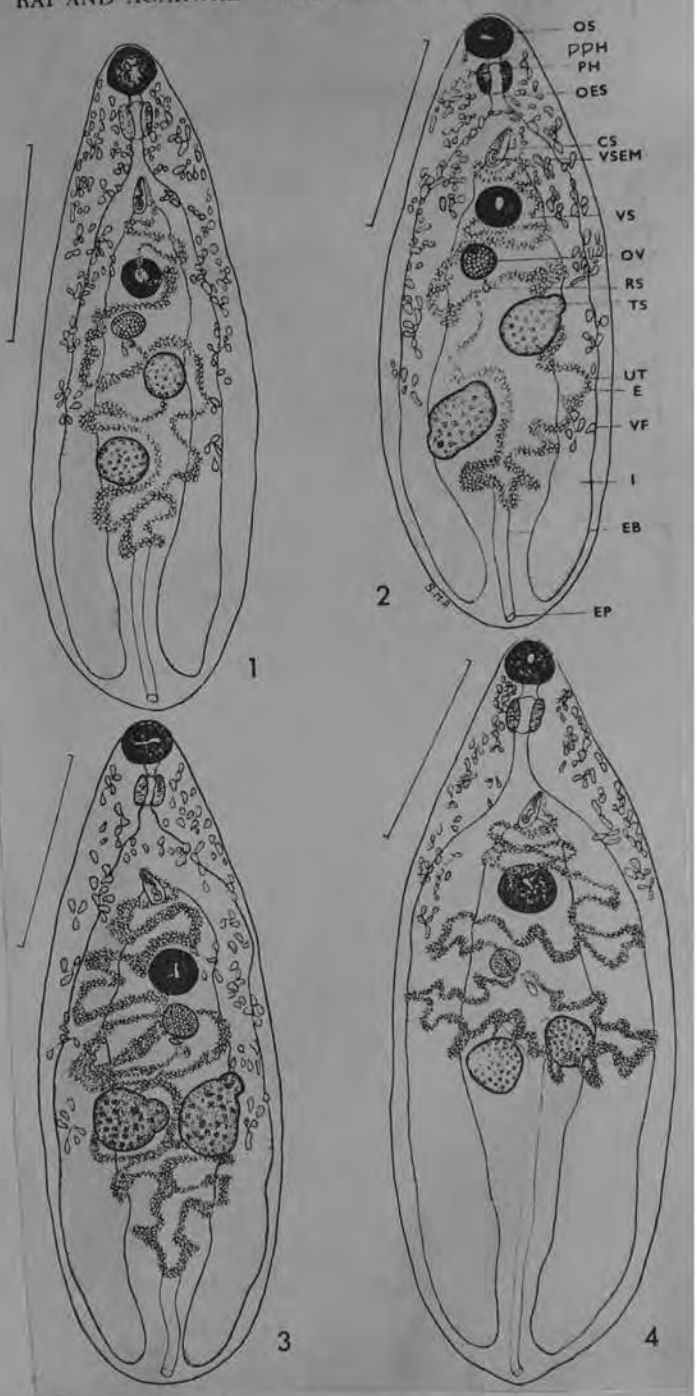


Xenopharynx solus Nicoll, 1912, from the Indian water snake. Scale = 1 mm.

Abbreviations: CS, cirrus sac; E, eggs; EB, excretory bladder; EP, excretory pore; I, intestinal ceca; OES, esophagus; OS, oral sucker; OV, ovary; PPH, prepharynx; PH, pharynx; RS, receptaculum seminis; TS, testis; UT, uterus; VF, vitelline follicles; VS, ventral sucker; VSEM, vesicula seminalis.

Figures 1 to 3. Worms from one snake showing variations in the position, lobation, and compara-

EMENDED DIAGNOSIS

(Measurements in millimeters of 31 mature worms)
(Figs. 1 to 4)

Body 2.55 to 6.14 long and 0.85 to 1.96 in maximum breadth at testicular level or immediately posterior to it; posterior end rounded, anterior end tapering to bluntly rounded point. Oral sucker 0.14 to 0.38 by 0.19 to 0.38; ventral sucker 0.19 to 0.33 by 0.19 to 0.35; oral sucker larger on average (0.25 by 0.29) than ventral sucker (0.25 by 0.26), but subequal or even slightly smaller in some worms. Prepharynx 0.03 to 0.08 long; pharynx 0.14 to 0.22 by 0.14 to 0.25; esophagus 0.11 to 0.39 long; intestinal ceca broad, reaching posterior end of body. Testes diagonal (Figs. 1 and 2) to side by side (Figs. 3 and 4), well separated or close together, ovoid and smooth to irregular and indented; their measurements 0.14 to 0.58 by 0.13 to 0.55. The variation observed relative to position of testes is not a function of maturity of the species because those variations were also observed in immature specimens. Cirrus sac 0.14 to 0.25 by 0.07 to 0.13, elliptical, slightly obliquely placed, and almost on the cecal bifurcation, containing coiled vesicula seminalis, pars prostatica, and ejaculatory duct; genital pore median or submedian, near intestinal bifurcation. Ovary in the middle third of body, sometimes close to acetabulum, smooth, ovoid, 0.09 to 0.22 by 0.09 to 0.24. Receptaculum seminis 0.11 to 0.16 by 0.07 to 0.12. Posterior extent of uterus varying from level of posterior testis to one well within posttesticular zone. Eggs numerous, 0.029 to 0.045 by 0.014 to 0.024. Vitelline follicles extend from region of oral sucker to a level varying from that of posterior testis in most specimens (Figs. 1, 2, and 3) to posterior margin of ventral sucker in one worm (Fig. 4); follicles of the two sides asymmetrical in their posterior limit in many worms. Excretory bladder having a long stem and two short arms.

Host: *Naja naja* (L.) and *Tropidonotus piscator* Wall, 1907.

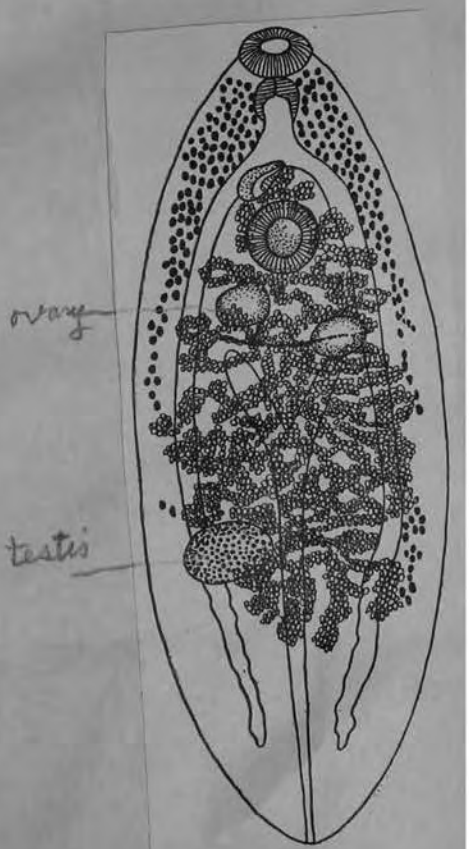
Location: Gall bladder.

DISCUSSION

The extent of variation in the authors' specimens of *Xenopharynx solus* from *Tropidonotus piscator* invalidates several "species" reported from that host. They are: *X. orientalis*, *X. nicolli*, *X. mehrai*, and *X. raipurensis*, each described from a single specimen by Tiwari (1959); *X. piscator* Bhalerao, 1926 and *X. heterovitellatus* Simha, 1957. Also considered synonyms are *X. hirakudensis* and *X. sambalus*, which Chatterji et al. (1961) named from one and three specimens respectively from the gall bladder of the Indian cobra *Naja naja*.

Accepted as valid species of *Xenopharynx* are: *X. pyriformis* Simha, 1957, from *Ptyas* (*Zamenis*) *mucosus*, because of its body shape, position of testes, and ratio of ventral to oral suckers; *X. biliphaga* Srivastava, 1956 (syn. *X. indica* Baugh, 1956), by its spinose cuticle; and *X. dhamini*, which Chatterji et al. (1961) described from a single specimen from *Ptyas mucosus*. The remarkable precequatorial position of the testes in *X. dhamini* was observed in none of the authors' 118 specimens of *Xenopharynx solus*.

Xenopharynx solus Nicoll, 1912



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184. *Xenopharynx solus* Nicoll, 1912 (по Николлю,

FROM SKRJABIN,

a) ***Xenopharynx solus*** NICOLL (1912). The writer obtained two specimens of this rare parasite from the gall bladder of *Naja naja*. Out of the 12 cobras examined during the month of November, 1954, only two of them harboured one specimen each in the gall bladder. Since there is some discrepancy in the earlier accounts of this species by NICOLL and KHALIL, the writer has considered it necessary to scribe the flukes in some detail.

These are fairly large sized worms having a transparent elliptical body. The length of the fluke varies between 5.089 and 5.742 mm. and the maximum width, which is attained in the testicular zone, ranges from 1.435 to 2.019 mm. The oral sucker is subterminal measuring 0.297—0.396 × 0.396—0.415 mm. The acetabulum lies at about the junction of the first and second quarters of the body and is somewhat smaller than the oral sucker. The latter leads by means of a very small prepharynx into the pharynx measuring 0.336 × 0.198 to 0.217 mm. In optical section it appears horse-shoe shaped and opens into a short but wide oesophagus, 0.2179—0.25 mm. long, which bifurcates into the two intestinal diverticula. The bifurcation is 0.2 mm. anterior to the acetabulum and from here the caeca run posteriorly. Behind the hind testis they extend in a slightly sinuous course terminating blindly at 0.3—0.35 mm. from the tail end. The excretory vesicle is in the form of a simple "Y" with a long median stem and two short limbs. The two smooth and oval testes lie in the third quarter of the body and are arranged diagonally one behind the other. The anterior testis is somewhat smaller than the posterior one and they measure 0.356—0.396 and 0.386 to 0.396 × 0.385—0.495 mm. respectively. At some distance from the acetabulum the small cirrus pouch lies transversely in close proximity with the intestinal bifurcation. It measures 0.26 × 0.14 mm. and encloses a small convoluted vesicula seminalis, a comparatively long pars prostatica, and a ductus ejaculatorius. The genital opening is median and located on the intestinal bifurcation.

Fig. 25. *Xenopharynx solus* NICOLL, 1912 (Ventral view)

The ovary is pretesticular as shown by KHALIL and lies at about 0.4 0.45 mm. behind the acetabulum. It is a rounded structure measuring 0.237—0.297 mm. in diameter. A small receptaculum seminis is discernible just behind the ovary. The vitellaria start roughly at the level of the pharynx and extend downwards to the level of the hind testis. The follicles lie crowded in the prefurcal region whilst posteriorly they are sparsely distributed in the lateral zones of the body partly overlapping the caeca. The transverse vitelline duct passes just behind the ovary and the shell gland lies immediately posterior to the latter. The uterus is large and voluminous, thrown into massive coils which at certain points overstep the caeca. In their posterior extent the uterine coils extend slightly beyond the hind testis, whilst anteriorly the terminal portion of the uterus runs in meandering course to open at the genital pore. The uterus is filled with brown eggs measuring 0.0309—0.0398 × 0.008—0.015 mm.

Host: *Naja naja*. — Habitat: Gall bladder. — Locality: Hyderabad, India.

FROM SIMHA, 1958

Xenopharynx biliphaga Srivastava, 1954

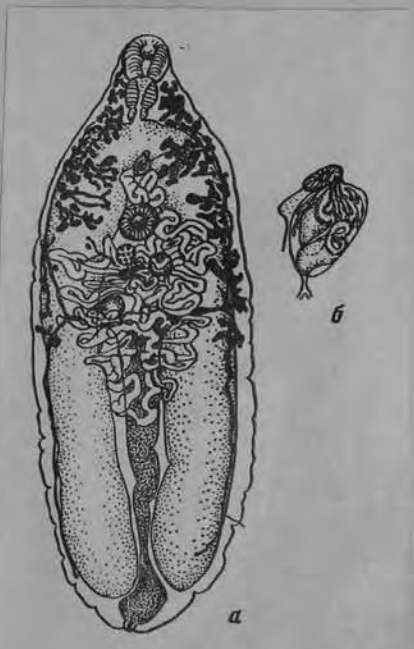
Bhaleropharynx biliphaga (Srivastava, 1954)

(Рис. 185а)

Синоним: [*Xenopharynx biliphaga* Srivastava, 1954

Хозяин: змея — *Tropidonotus piscator*.
Локализация: желчный пузырь.
Место обнаружения: Индия.

Описание вида (по Сривастава, 1954). Тело 4,3 мм длины и 1,59 мм ширины. Ротовая присоска 0,25 × 0,31 мм; брюшная присоска 0,25 мм в диаметре. Фаринкс 0,19 × 0,22 мм. Ширина кишечных стволов достигает 0,5 мм. Семенники лежат по диагонали в передней половине тела, позади брюшной присоски. Передний семенник располагается на одном уровне с яичником, а задний — позади яичника. Имеется семяприемник. Яйца 0,035—0,044 мм длины и 0,02 мм ширины. Желточники — в передней половине тела, простираются от заднего края ротовой присоски до середины длины тела. Задние петли матки переходят несколько уровень середины длины тела.



185а

185а. *Bhaleropharynx biliphaga* (Srivastava, 1954) (по Сривастава, 1954)

а — марита; б — концевой участок полового аппарата

FROM SKRJABIN, VOL. 14

Genus: *Xenopharynx* Nicoll, 1912

Xenopharynx biliphaga Srivastava, 1954
(Figs. 12-17)

Seven specimens of this form were collected from the gall bladder of a water snake, *Tropidonotus piscator* (Wall.) at Lucknow.

DESCRIPTION: Body enlongated, espinose with a bluntly conical anterior and rounded posterior end, 1.54-4.62 × 0.62-1.70 mm in size. Oral sucker spherical, subterminal, 0.14-0.36 × 0.15-0.35 mm in size. Prepharynx well developed, 0.02-0.06 × 0.11-0.18 mm in size; pharynx globular, 0.09-0.8 × 0.10-0.24 mm in size; esophagus 0.11-0.26 mm it long; intestinal ceca equal or subequal, extended almost to hind end of body or a little anterior to it, simple or sinuous, narrow or as broad as half the maximum width of body and occupying almost whole space within body. Ventral sucker oval or spherical, smaller than oral sucker, 0.16-0.20 × 0.16-0.32 mm in size at 0.84-1.33 mm nearly one third from anterior extremity.

Genital pore median at cecal bifurcation at 0.52-0.86 mm. from anterior extremity. Excretory pore terminal. Excretory bladder Y-shaped and branching behind testes.

Testes spherical, entire, intercecal of partly cecal, equal or subequal, equatorial, postequatorial, diagonal or symmetrical. Right testis, 0.06-0.30 × 0.07-0.34 mm in size at 0.98-1.32 mm from anterior extremity and left testis, 0.06-0.37 × 0.07-0.33 mm in size at 0.88-1.48 mm from hind end of body. Cirrus sac elongated, pear shaped, 0.12-0.29 × 0.05-0.13 mm in size overlapping intestinal bifurcation at 0.06-0.20 mm in front of ventral sucker. Vesicula seminalis tubular and coiled, 0.10-0.51 × 0.011-0.041 mm in size; ejaculatory duct short, 0.012-0.026 mm long, opening at genital pore; pars prostatica long, sac-like, 0.04-0.095 × 0.01-0.025 mm in size, surrounded by a large number of prostate gland cells.

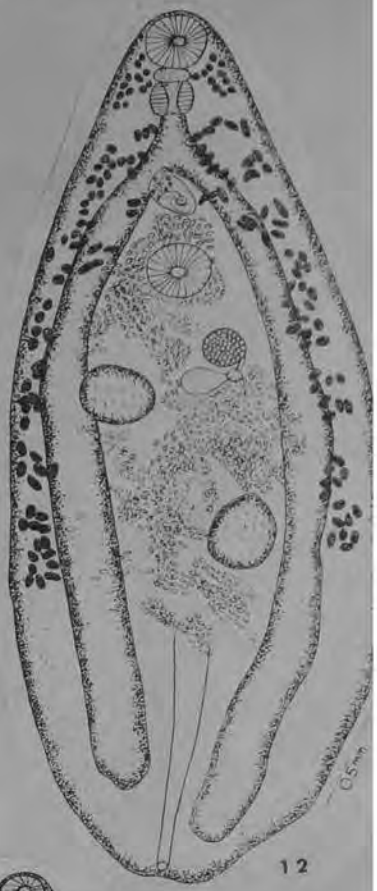
Ovary ovoid, smaller or larger than testes, pretesticular, submedian, 0.04-0.20 × 0.05-0.19 mm in size, close or away from ventral sucker. Its lies on left side of body at 0.78-0.95 mm from anterior extremity. Receptaculum seminis pear shaped, 0.03-0.14 × 0.04-0.22 mm in size, immediately behind ovary. Vitellaria follicular extending from sides of oral sucker to anterior level of anterior testis or up to a little posterior to hind end of posterior testis. They overlap intestinal ceca, occasionally extending beyond inner margins of latter. In some specimens vitellaria are uneven in their posterior extent. Two vitelline ducts of either side join each other near oötype to form a common vitelline duct. Descending uterus extends from oötype in regular loops behind posterior testis and then ascends passing between testes to open at genital pore. Uterus largely intercecal crossing inner margins of ceca irregularly. Eggs oval, operculated, 0.031-0.05 × 0.015-0.030 mm in size.

HOST: *Tropidonotus piscator* (Wall.)

LOCATION: Gall bladder.
LOCALITY: Lucknow.

DISCUSSION: To date the genus *Xenopharynx* Nicoll comprises the following 13 species:

Xenopharynx solus Nicoll, 1812, type species; *X. piscator* Bhalerao, 1926; *X. biliphaga* Srivastava, 1954; *X. indica* Baugh, 1956; *X. pyriformis* Simha, 1958; *X. heterovitellatus* Simha, 1958; *X. nicolli* Tewari, 1959; *X. orientalis* Tewari, 1959; *X. raipurensis* Tewari, 1959; *X. mehrai* Tewari, 1959; *X. hirakudensis* Chatterji et Kruidenier, 1961; *X. sambalus* Chatterji et Kruidenier, 1961; *X. dhamini* Chatterji et Kruidenier, 1961.



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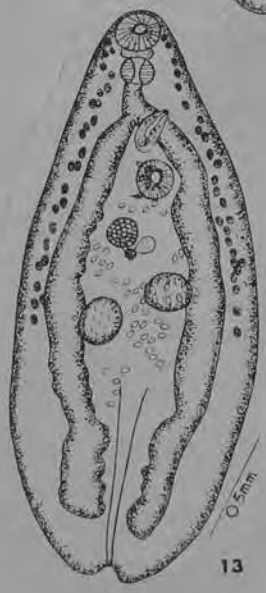

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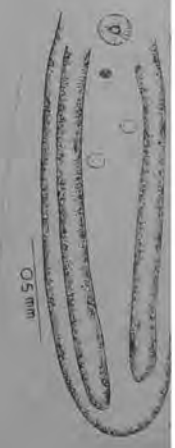

Rai and Agrawal (9) recognised *X. solus* Nicoll, 1912 from *Tropidonotus piscator* at Jabulpur. Due to morphological variations they considered that *X. orientalis*, *X. nicoll*, *X. mehrai*, *X. raipurensis*, *X. piscator*, *X. heterovitellatus*, *X. hirakudensis* and *X. sambalus* are synonyms of *X. solus*. They recognised the following valid species, besides *X. solus*: *X. pyriformis*, *X. biliphaga* (Syn. *X. indica*) and *X. dhamini*. The author does not agree with Rai and Agrawal and considers that *X. piscator* and *X. heterovitellatus* are valid species and *X. orientalis*, *X. nicolli*, *X. mehrai*, *X. raipurensis*, *X. hirakudensis* and *X. sambulus* are synonyms of *X. biliphaga* instead of *X. solus*.

The present form is referred to *X. biliphaga* Srivastava, 1954 obtained from *Tropidonotus piscator* at Lucknow. In the author's specimens the size, shape and relative position of testes and ovary, narrow or wide ceca, position of genital pore, extend of uterine coils and vitellaria and relative size of prepharynx are highly variable characters. Baugh (2) described *X. indica* from the gall bladder of a colubrid snake from Banaras. On a careful comparison of the description of this species with the specimen of *X. biliphaga* at the author's disposal it is found that both species are identical. The difference existing between *X. biliphaga* and *X. indica* is the presence of spines on the ventral surface of the body, which in the opinion of the author should not form a basis for the separation of one species from the other. The author is therefore in agreement with Rai and Agrawal (9) in considering *X. indica* to be a synonym of *X. biliphaga*. Tewari (14) distinguished *X. nicolli*, *X. mehrai* and *X. orientalis* from all other species in having testes symmetrically placed at one level, and *X. haipurensis* from *X. pyriformis* in the posterior extent of vitellaria, in having testes prequatorial and in the relative size of suckers. In the author's specimens the testes are symmetrical or obliquely one behind the other or nearly opposed across mid line, equatorial, pre- or postequatorial, equal or unequal in size and the vitellaria extend from oral sucker up to anterior level of anterior testis or a little posterior to hind end of testes. Consequently *X. nicolli*, *X. mehrai*, *X. orientalis*, *X. raipurensis* and *X. pyriformis* fall into synonymy of *X. biliphaga*. Further, the extent of variation in the author's specimens invalidates *X. heterovitellatus*. Chatterji and Kruidenier (5) distinguished *X. hirakudensis* from *X. biliphaga* in the extent of vitellaria, well developed prepharynx, ovary smaller than testes, ventral sucker smaller than oral sucker and in having narrow intestinal ceca; *X. sambalus* from *X. hirakudensis* mainly in having vitellaria up to anterior margin of anterior testis; testes nearly in the same plane; excretory bladder bifurcating well anterior to testes and in having intestinal ceca broader; *X. dhamini* from *X. biliphaga* in having testes opposing and intestinal ceca narrow. In the author's opinion all these forms are identical and fall into synonymy with *X. biliphaga*.

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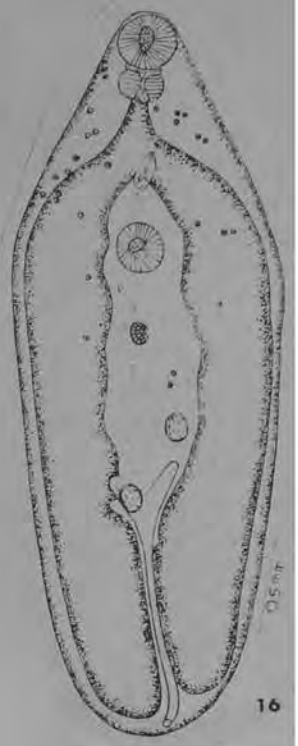

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The genus *Xenopharynx* therefore comprises the following four valid species with their synonyms:

X. solus Nicoll, 1912, type species.

X. piscator Bhalerao, 1926.

X. biliphaga (Syns. *X. indica* Baugh, 1956; *X. heterovitellatus* Simha, 1957; *X. nicolli* Tewari, 1959; *X. orientalis* Tewari, 1959; *X. mehrai* Tewari, 1959; *X. raipurensis* Tewari, 1959; *X. hirakudensis* Chatterji et Kruidenier, 1961; *X. sambalus* Chatterji et Kruidenier, 1961; *X. dhamini* Chatterji et Kruidenier, 1961 and *X. heterovitellatus* Simha, 1958).

X. pyriformis Simha, 1958.

Xenopharynx dhamini, n. sp. (Pl. II, Figs. 7–9)

Chatterji & Kruidenier, 1961

DESCRIPTION: one specimen. Aspinose; more or less cylindrical, 3.75 mm. x 1.47 mm. with maximum breadth in post-median region; oral sucker subterminal, transversely oval, 0.21 mm. x 0.28 mm; prepharynx distinct, only 0.027 mm. long; pharynx 0.137 mm. x 0.158 mm.; esophagus 0.31 mm. long with bifurcation 0.67 mm. from the anterior end of the parasite; caeca simple, parallel to body wall and extending to 0.33 mm. from posterior end, and 0.21 mm. at their widest point; acetabulum weak, 0.23 mm. in diameter and 0.37 mm. behind caecal bifurcation; gonads slightly anterior to mid-body; ovary spherical, almost touching the right posterior border of the acetabulum, 0.22 mm. x 0.21 mm.; testes opposing, ovoid, right testis 0.20 mm. x 0.13 mm. and left testis 0.24 mm. x 0.16 mm., 0.085 mm. behind and slightly to the right of the ovary; cirrus pouch well-developed, 0.156 mm. x 0.092 mm. and at the caecal bifurcation; seminal vesicle tubular, looped, enlarged; prostate cells numerous around moderate *pars prostatica*; ejaculatory duct muscular. *Receptaculum seminis* well-developed, elongate, 0.26 mm. x 0.071 mm., immediately behind the ovary and slightly overlapping the left testis; excretory bladder Y-shaped with long stem, bifurcation just behind the testes with the left branch extending forward between the testes and the right branch extending across the body of the parasite, behind the left testis; eggs operculate, 0.037–0.045 mm. x 0.013–0.018 mm.

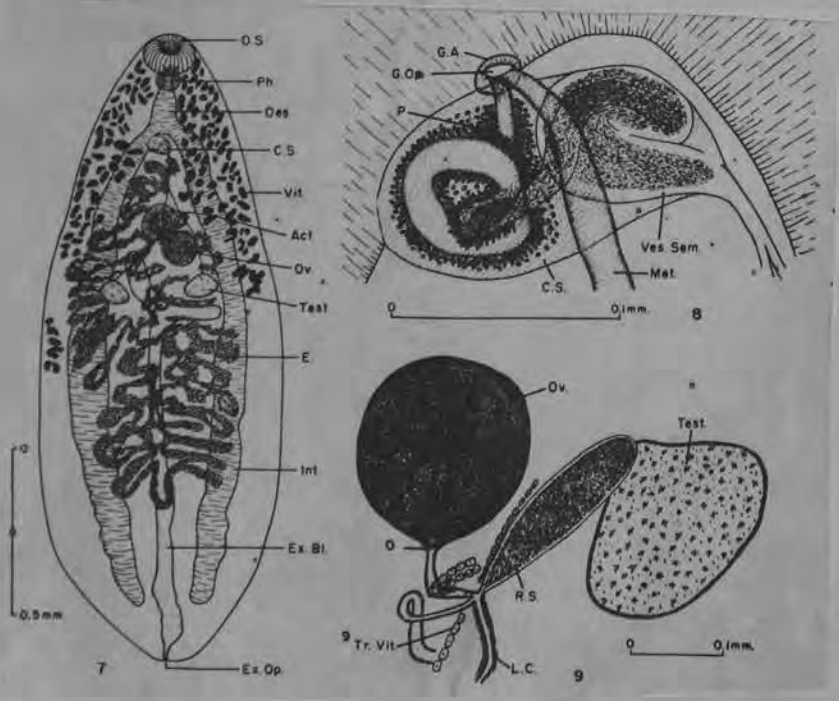
Vitelline follicles, in small clusters, are distributed laterally from the mid-oral sucker level to the level of the posterior margins of the testes. One follicle, on the left side, is located well behind the testes. The follicles overlap the caeca, occasionally extending beyond the inner margins of the latter. Right and left common vitelline ducts cross the body between the ovary and the testes, forming a small, duct-like vitelline reservoir from which a short common vitelline duct enters the oviduct. The oviduct proceeds posteriad from the oötapt at the mesial, posterior border of the ovary, giving off a duct from the seminal receptacle and Laurer's canal and receiving the common vitelline duct before it enters the oötype. Mehlis' gland is weak. The descending uterus loops irregularly to within 0.90 mm. of the posterior end of the worm before ascending in series of loops to the muscular metraterm. The latter crosses the cirrus pouch ventrally to the genital atrium at the caecal bifurcation. The uterus extends only irregularly into the extracaecal zone.

Vasa efferentia and *vas deferens* are much as described for *X. hirakudensis* and *X. sambalus*.

Host: *Ptyas mucosus* (L.): Indian rat snake.
Habitat: Gall-bladder.
Holotype: U. S. Nat'l Mus. Helm. Coll. No. 39056.
Locality: Cuttack, Orissa, India.

Remarks: Its premedian testes differentiate *X. dhamini* from all other described species of *Xenopharynx* except *X. biliphaga*. The testes of the latter are placed on a distinct diagonal and the intestinal caeca are strikingly broader than those of *X. dhamini*.

Syn. of X. sambalus



Simha, 1958

c) ***Xenopharynx heterovitellatus*** **n. sp.** This fluke was obtained on numerous occasions from the gall bladder of the water-snakes, *Tropidonotus piscator*, dissected during August, September and October, 1954. Usually about 8—10 specimens occur in the gall bladder of infected hosts.

The fluke has an elongated body with a conical tail end and a sharply marked off cephalic end. The body measures 3.5—6 mm. in length and 1.23—2.4 mm. in maximum width which is attained at about the middle of the body. The cuticle is smooth and unarmed. The cephalic end bears the subterminal oral sucker which surrounds the ventrally directed mouth and measures 0.22—0.42 × 0.2—0.42 mm. The acetabulum, 0.22—0.35 mm.; in diameter, lies at a distance of 0.9 to 1.45 mm. from the cephalic end with its hind border extending slightly backwards beyond the dividing line between the anterior and middle thirds of the body. The oral sucker communicates with the pharynx by means of a short prepharynx which is seen to an advantage in the live condition when the fluke is fully extended and is examined under pressure of the cover glass. The pharynx is well developed measuring 0.25—0.35 mm. in diameter and has the characteristic horse-shoe shape. The oesophagus which is very small, about 0.25—0.28 mm. long, divides

immediately into the two caeca. The hind border of the fork is equidistant from the pharynx and the acetabulum. The caeca in the fluke under study assume huge proportions occupying most of the available space in the body. Their posterior ends approaching the caudal end lie closely approximated together. The excretory vesicle is "Y"-shaped with the median stem extending forwards to the middle of the body where it bifurcates into the right and left limbs. Posteriorly the median stem expands slightly before it opens at the median and terminal excretory pore. The testes lie in the third quarter of the body and are arranged diagonally one behind the other. The anterior testis is rounded whilst the posterior one is slightly lobed. The testes measure 0.23 × 0.30—0.35 mm. The cirrus pouch is extremely small and located in the angle of the fork. It encloses a convoluted seminal vesicle, pars prostatica and a short ductus ejaculatorius. The genital pore is placed at the bifurcation of the caeca as shown in Fig. 27.

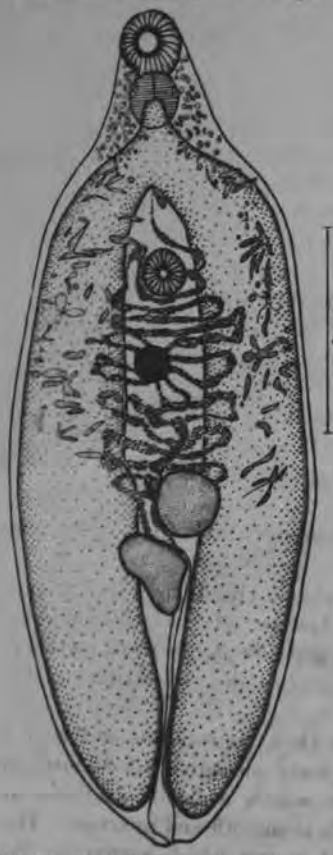


Fig. 27. *Xenopharynx heterovitellatus* n. sp. (Ventral view)

The ovary is situated in front of the testes widely separated from them. It lies 0.12—0.3 mm. posterior to the ventral sucker and measures 0.18 to 0.23 mm. in diameter. Receptaculum seminis can be seen in the live condition but it is difficult to observe in the fixed specimens. The uterus forms transverse coils which project slightly over the caeca. The coils of the uterus extend between the testes and the acetabulum, and in front of the latter the metraterm proceeds almost straight to the genital pore. The vitellaria are distributed in the lateral zones of the body from the oral sucker down to the level of the anterior testes. The vitelline follicles found anterior to the fork are rounded whilst those placed further back are elongated. The transverse vitelline duct passes just behind the ovary. The uterus contains brownish yellow eggs which are operculated; they measure 0.036—0.044 × 0.013—0.014 mm.

Discussion. In general appearance this form resembles *X. piscator* BHALERAO, 1926, described from the same host *Tropidonotus piscator*. It, however, differs from it in the distribution of vitellaria which are confined to the anterior half of the body in the new parasite. Besides, the testes also differ in size in the two species, being much bigger in *X. heterovitellatus*. The uterus does not extend posteriorly beyond the testes in the fluke under study while it does so in *X. piscator*. The new form is further distinguishable by the presence of much dilated caeca. As a result of these differences, it is felt necessary to create a new species for the reception of the newly found fluke. It is proposed to name it *Xenopharynx heterovitellatus* n. sp.

Specific diagnosis. Body elliptical; cuticle non-spinous; oral sucker terminal; prepharynx very small; pharynx horse-shoe shaped; oesophagus short; caeca dilated; excretory bladder "Y"-shaped. Testes large, situated behind middle of the body; ovary placed anterior to middle of body but distinctly behind acetabulum; receptaculum seminis present; vitellaria confined to anterior half of body; uterine coils extend considerably behind testes.

Principial measurements. Length, 3.5—6.0 mm.; breadth, 1.23 to 2.4 mm-; oral säcker. 0.22—0.42×0.20—0.42 mm.; acetabulum, 0.22 to 0.35 mm. in diameter; pharynx, 0.25—0.35 mm. in diameter; oesophagus, 0-25—0.28 mm. long; intestinal caeca, 0.54—0.58 mm. broad Testes, 0.23×0.30—0.35 mm.; ovary, 0.18—0.23 mm in diameter; eggs operculated, 0.036—0.044×0.013—0.014 mm.

Host: *Tropidonotus piscator*. — Habitat: Gall bladder. — Locality: Hyderabad, India. — Type specimens are deposited in the museum of the Zoology Department, Osmania University, Hyderabad.

Xenopharynx hirakudensis, n. sp. (Pl. I, Figs. 1–3)

DESCRIPTION: one specimen. Aspinose; more or less cylindrical, 3.4 mm. x 0.91 mm.; oral sucker spherical, subterminal, 0.23 mm. in diameter; prepharynx well-developed, 0.07 mm. x 0.12 mm.; pharynx widest anteriorly, strong with anterior indentations, shallow, 0.12 mm. x 0.14 mm.; esophagus, 0.25 mm. x 0.081 mm., with bifurcation 0.72 mm. from anterior end; caeca simple, parallel to body wall and extending to within 0.26 mm. of posterior end, slender, (approximately 0.15 mm. at widest point); acetabulum weak, 0.22 mm. x 0.19 mm. and 0.23 mm. behind caecal bifurcation; testes spherical, obliquely opposed across mid-line with the anterior 0.23 mm. x 0.21 mm. and 0.21 mm. posterior to ovary and the posterior of the same size as and 0.07 mm. behind anterior; cirrus sac well-developed, 0.16 mm. x 0.08 mm. and immediately behind the intestinal bifurcation. Ovary 0.15 mm. x 0.17 mm. and 0.093 mm. posterior to acetabulum, slightly anterior to mid-body; seminal receptacle elongate ovoid, 0.063 mm. x 0.063 mm.; eggs operculate, yellowish-brown, 0.032–0.050 mm. x 0.021–0.029 mm.; excretory bladder Y-shaped and branching between testes; branches short, extending slightly anterior to anterior testis; excretory pore terminal.

The vitelline follicles are associated in small clusters from the area in which the oral sucker meets the body wall to the anterior level of the anterior testis and from the lateral body wall to the outer margins of the caeca which they overlap only slightly. The follicles from either side closely approach the midline ventral to the esophagus but are distinctly separated dorsal to that organ. Confluent collecting ducts enter right and left transverse vitelline ducts which meet posterior to the ovary in the very small but distinct vitelline reservoir. A very short common vitelline duct empties into the oviduct.

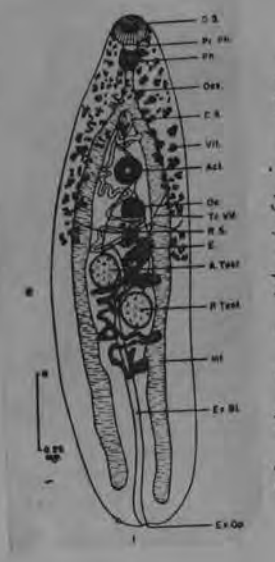
A funnel-shaped oöcapt (Fig. 3) at the left posterior margin of the ovary opens into a short oviduct. The latter gives off a short tube which bifurcates into the Laurer's canal and the small, ovoid seminal receptacle and receives the common-vitelline duct before recurving to the weak oötype. Mehlis' gland is weak. The oötype opens posteriorly into a descending uterus which extends in irregular loops to well behind the posterior testis before recurving in the series of lateral loops which form an ascending uterus. The uterus is largely intra-caecal, crossing the inner margins of the caeca irregularly. A muscular metraterm is surrounded by series of unicellular glands. It enters the genital atrium at the level of the caecal bifurcation. Laurer's canal is directed posteriad almost to the anterior testis before it curves to the dorsal surface. Numerous small gland cells are distributed along its length.

The *vasa efferentia* parallel the inner margins of the caeca and converge dorsal to the acetabulum. They proceed separately to the base of the cirrus sac where they join into a very short *vas deferens* (0.015 mm.). The latter enlarges slightly within the cirrus sac as a coiled, tubular seminal vesicle. A muscular ejaculatory duct then enters the genital atrium.

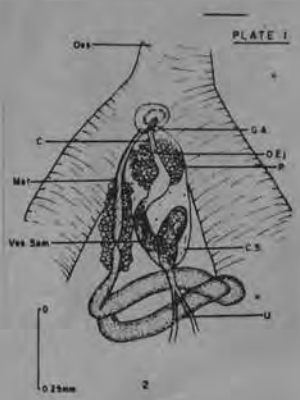
Holotype: U. S. Nat'l Mus. Helm. Coll. No. *39054*.
Host: *Naja naja* (L.); the Indian Cobra.
Habitat: Gall bladder.
Locality: Sambalpur, Orissa, India.

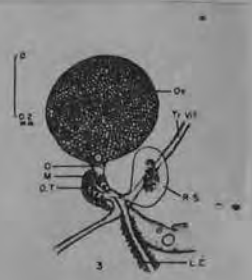
Remarks: Although the generally smaller size of its body and discrepancies in the sizes of different organs possibly might be attributed to age or host differences, *X. hirakudensis* differs from *X. piscator* and *X. biliphaga* also in the distribution of its vitellaria, its well-developed prepharynx, an ovary that is appreciably smaller than either testis, and an acetabulum that is smaller than its oral sucker. It resembles *X. biliphaga* but differs from *X. piscator* in possessing an extremely short *vas deferens* and resembles *X. piscator* while differing from *X. biliphaga* in having relatively narrow intestinal caeca.

Xenopharynx hirakudensis, from the same organ and host as *X. solus*, differs from the latter in size of body and organs as well as significantly differently placed testes, its prepharynx, the restricted posterior distribution of its vitellaria and, possibly, the orientation of its cirrus pouch along the median line of the parasite rather than to the right of that median.



Chatterji: Z Krui dinier, 1961





Syn. of
X. solus

Xenopharynx indica sp. nov. Baugh, 1966

Four mature specimens of this fluke, three entire and one macerated, were obtained from the gall-bladder of a Colubrid snake†, freshly skinned carcass of which was obtained from a dealer in snake-skins at Banaras Cantt.

The body (Fig. 1a) is broad and dorsoventrally flattened with a bluntly conical anterior and a rounded posterior end. The specimens measure 2·27-2·39 mm. in length and 1·07-1·15 mm. in maximum breadth in the region of the testes. The entire body is covered with small closely-set and sharply pointed spines. The strongly muscular oral sucker measures 0·207-0·232 mm. × 0·240 mm. The ventral sucker is rather weakly muscular, situated near the posterior limit of the anterior third of the body at a distance of 0·577 mm. from the anterior end and measures 0·199-0·207 mm. × 0·207-0·224 mm.

The mouth leads through a short contracted prepharynx into a large, well-developed, and globular pharynx measuring 0·148-0·166 mm. × 0·157-0·165 mm. Within the pharynx is invaginated a portion of the oesophagus. The oesophagus is very short measuring about 0·066 mm. in length and it bifurcates into the intestinal caeca in front of the ventral sucker at a distance of 0·330-0·445 mm. from the anterior end. The intestinal caeca which extend back-right upto the posterior end of the body are as broad as half the maximum width of the body and consequently they occupy almost the whole of the available space within the body.

The testes are round, slightly unequal in size, and are situated obliquely one behind the other about 0·049-0·099 mm. apart. The anterior testis, which is pre-equatorial in position and slightly deflected to the left, measures 0·212-0·252 mm. in diameter; while the posterior one, which is post-equatorial and slightly deflected to the right, measures 0·212-0·266 mm. in diameter. The cirrus-sac is an elongate-oval structure extending across the caecal bifurcation and the anterior border of the ventral sucker, the latter being slightly overlapped by it. It measures 0·156-0·169 mm. × 0·085-0·091 mm., and encloses a curved S-shaped vesicula seminalis, pars prostatica with prostatic cells, and ductus ejaculatorius. The genital pore is located ventrally in the mid-longitudinal line of the body at the caecal bifurcation.

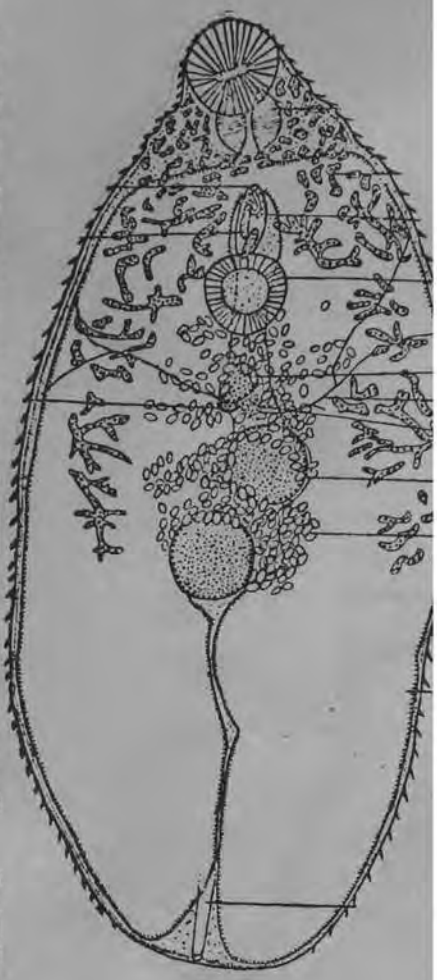
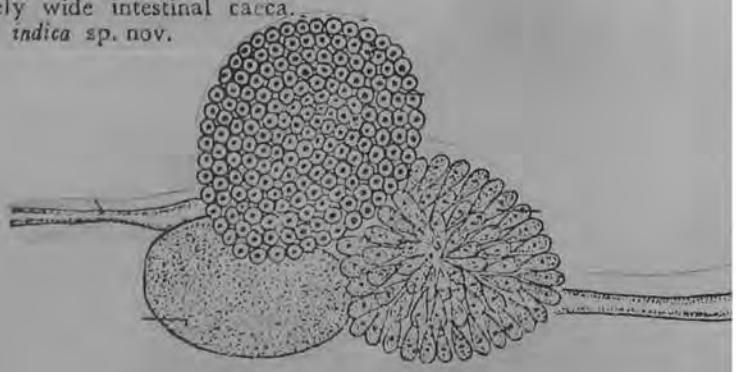


Fig. 1a

The ovary is a small ovoid structure, mesially situated about 0·049-0·066 mm in front of the anterior testis and measures 0·115-0·132 mm. × 0·099 mm. The vitellaria extend from the sides of the oral sucker, lying ventral to the intestinal caeca, upto the level of the posterior testis. The follicles at the anterior region of the body are small, irregular and dense whereas those further behind are large, dendritic and sparse. The vitellaria of either side closely approach each other and tend to merge together in the region of the pharynx. The vitelline ducts meet mesially in front of the anterior testis to form a short median duct opening into the ootype surrounded by the shell-gland mass. A Laurer's canal is present. The receptaculum seminis measuring about 0·099 mm. × 0·049 mm. lies (Fig. 1b) at the postero-dorsal side of the ovary. The coils of the uterus are indistinct. They pass posteriorly between the testes upto the end of the posterior testis or slightly beyond it. The eggs are elliptical to oval and operculated, may be partly embryonated, and measure 0·0364-0·0416 mm. × 0·0182-0·0286 mm.

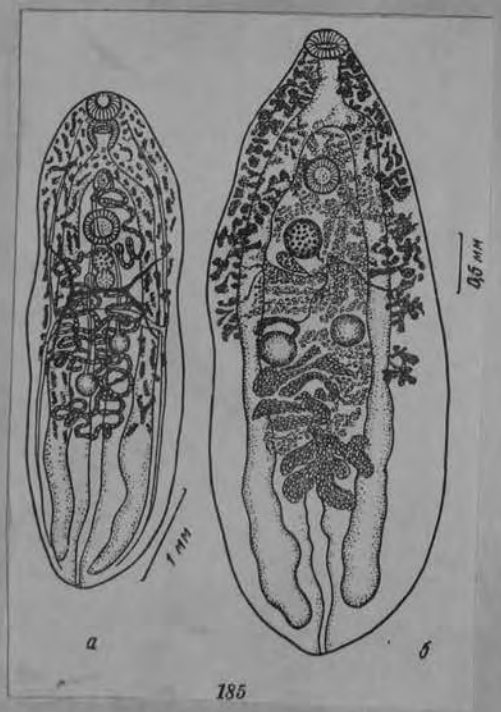
The excretory pore is terminal leading into an elongated excretory bladder traceable upto the level of the anterior testis.

The genus *Xenopharynx* Nicoll, 1912 includes at present only two species viz., *X. solus* Nicoll, 1912 and *X. piscator* Bhalerao, 1926. The present form differs from both these species chiefly in having a short prepharynx, a spiny body, an ovary much smaller than the testes, and lastly in possessing extremely wide intestinal caeca. It is, therefore, a distinct species and is named *Xenopharynx indica* sp. nov.



Xenopharynx piscator Bhalerao, 1926

Bhaleropharynx **piscator** (Bhalerao, 1926)



185. *Bhaleropharynx piscator* (Bhalerao, 1926)
а — по Валерао, 1926; *б* — по Халлу, 1923

From Skrjabin, vol. 14

Xenopharynx pyriformis Simha, 1958

b) *Xenopharynx pyriformis* n. sp. The following account of a new species of *Xenopharynx* is based on material collected on numerous occasions from the gall bladder of the rat-snake, *Ptyas (Zamenis) mucosus*. — These are non-spinous distomes having a pyriform transparent body with a blunt anterior end and a broadly rounded posterior end. The body measures 2.733—3.96 mm. in length and 1.287 to 1.921 mm. in maximum width which is reached in the testicular zone. The oral sucker is subterminal in position and surrounds the ventrally directed mouth; it is circular in outline measuring 0.217—0.267 mm. in diameter. The acetabulum is placed roughly at the junction of the anterior and middle thirds of the body; as compared with the oral sucker it is slightly bigger in size measuring 0.297—0.356 mm. in diameter. The excretory vesicle is tubular in character and resembles that found in *Eurotrema* species. It opens to the exterior at the posterior end by the median and terminal excretory pore. The pharynx lies posterior to the oral sucker and is globular in shape, having a diameter of 0.158—0.198 mm. It presents the appearance of a horse-shoe like structure, a feature which is so characteristic of the genus. A short and thick oesophagus, about 0.14 –0.27 mm. long, divides into a pair of quite prominent and dilated caeca. These extend posteriorly into the caudal region of the body where they terminate in rounded tips situated about 0.28 mm. from the tail end. The testes are large oval bodies located in the third quarter of the body. They possess entire margins and are obliquely set. They are subequal in size, the anterior testis measuring 0.277—0.356 × 0.396—0.475 mm. and the posterior one 0.297—0.495 × 0.435—0.452 mm. The cirrus-sac is very small measuring 0.18 × 0.10 mm.; it lies between the acetabulum and the fork, being placed closer to the latter with the genital pore actually opening ventrally to it as illustrated in Fig. 26. The cirrus-sac encloses within it a seminal vesicle, a pars prostatica and a small cirrus. The genital opening is either median or slightly shifted laterally. The ovary is placed in front of the testes and is situated close behind the acetabulum to the right of the median line; it is smooth and almost spherical in shape, measuring 0.198—0.217 mm. in diameter. A small receptaculum seminis is also present.

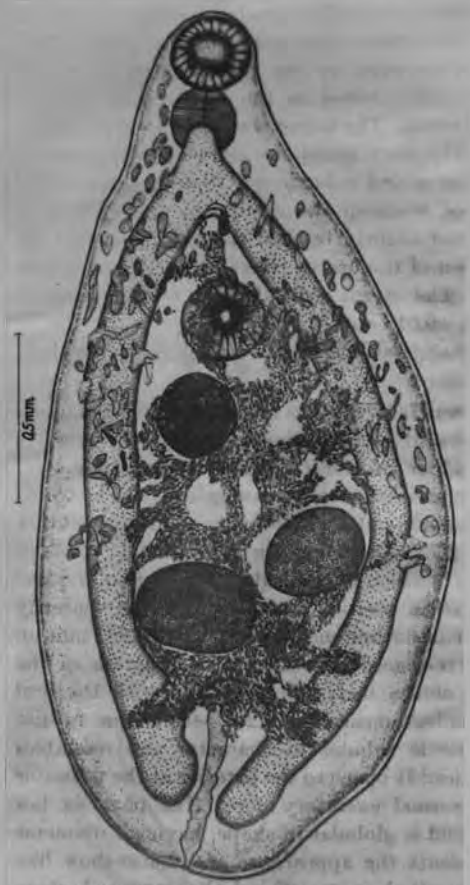


Fig. 26. *Xenopharynx pyriformis* n. sp. (Ventral view)

The oviduct arises from the left side of the ovary and runs for a short distance towards the median line, where uniting with the common vitelline duct and the duct of the receptaculum seminis it enters into a rather ill-defined shell gland. The uterus which forms descending and ascending limbs is thrown into coils which occupy most of the intercaecal space. Posteriorly the uterine coils extend beyond the hind testis partly overlapping the caeca. The vitellaria are distributed in the lateral zones of the body and the follicle mostly lie over the caeca. They reach into the pharyngeal region in front and extend posteriorly to the level of the testes. The uterus is packed with brownish eggs which measure 0.032—0.036 × 0.011—0.013 mm.

Discussion. This form differs from all the known species of the genus in the following features: 1. The body is pear-shaped, being

—OVER—

broadest at the level of the testes. 2. The testes are larger than those of the two known species and are placed posteriorly. 3. The ventral sucker is larger than the oral sucker. 4. The uterine coils extend considerably into the posterior third of the body. In view of the distinguishing features exhibited, the fluke described above is considered to be new to Science and it is, therefore, proposed to name it *Xenopharynx pyriformis* n. sp.

Specific diagnosis. Pear-shaped body; cuticle non-spinous; oral sucker subterminal; ventral sucker somewhat larger than oral sucker; oesophagus short; caeca extend into subcaudal region of body. Testes large, placed diagonally one behind the other, and post equatorial in position; ovary considerably in front of testes and closer to acetabulum; uterine coils extend into the posterior third of the body; eggs operculated.

Principal measurements. Length, 2.733—3.96 mm; breadth, 1.287 to 1.921 mm; oral sucker, 0.217—0.267 mm. in diameter; ventral sucker, 0.297—0.356 mm. in diameter; pharynx, 0.158—0.198 mm; oesophagus, 0.14—0.27 mm. long. Anterior testis 0.277—0.356 × 0.396—0.475 mm.; posterior testis, 0.297—0.495 × 0.435—0.452 mm.; ovary, 0.198—0.21 in diameter; eggs, 0.032—0.036 × 0.011—0.013 mm.

Host: *Ptyas (Zamenis) mucosus.* — Habitat: Gall bladder. — Locality: Hyderabad, India.

Type specimens are deposited in the museum of the Zoology Department, Osmania University, Hyderabad.

Chatterji & Kruidenier, 19

Xenopharynx sambalus, n. sp. (Pl. I, Figs. 4–6)

DESCRIPTION: three specimens. Aspinose, more or less elliptical; 4.33–4.38 mm. x 1.89–2.17 mm. and with maximal breadth at level of testes; oral sucker subterminal, 0.23–0.33 mm. x 0.31–0.35 mm.; prepharynx extremely short but muscular; pharynx slightly narrowed posteriorly, 0.158–0.174 mm. x 0.151–0.186 mm.; esophagus 0.33–0.41 mm. long with bifurcation 0.72–0.87 mm. from anterior end; caeca parallel to lateral body wall to within 0.36–0.42 mm. from posterior end, slender (approximately 0.24 mm. at widest); acetabulum roughly spherical, 0.26–0.33 mm. x 0.27–0.37 mm., and 0.24–0.27 mm. behind caecal bifurcation; testes postmedian, spherical, nearly opposed across mid-line, 0.31–0.44 mm. x 0.35–0.44 mm.; cirrus sac well-developed, at the caecal bifurcation, 0.185–0.264 mm. x 0.143–0.158 mm.; seminal vesicle well-developed, tubular, sinuous to loosely coiled; *pars prostatica* small with a weak prostate gland; ejaculatory duct muscular; ovary pretesticular, 0.17–0.23 mm. x 0.24–0.29 mm. and 0.12–0.20 mm. behind the acetabulum, slightly dextral to the mid-line; genital atrium present; genital atrium and pore median, at the level of the caecal bifurcation; eggs numerous, operculate, yellowish-brown, 0.034–0.050 mm. x 0.016–0.019 mm.; excretory bladder tubular, Y-shaped with short branches just behind the level of the ovary; excretory pore terminal.

Small clusters of vitelline follicles extend from the mid region of the oral sucker to mid-way between the ovary and the testes and are largely extra-caecal. The right and left vitelline ducts, vitelline reservoir and common vitelline duct approximate those in *X. hirakudensis*.

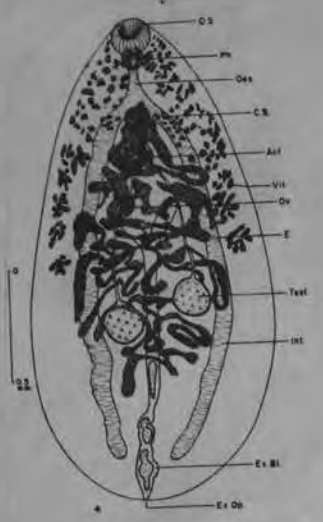
The oöcapt at the posterior median margin of the ovary leads into a short oviduct. The latter gives off a short tube which bifurcates to the markedly elongate seminal receptacle and to Laurer's canal and receives the common vitelline duct. The oviduct recurves dorsally into the oötype which is surrounded by a weak Mehlis' gland. The descending uterus extends from the oötype in irregular loops to well behind the posterior testis and then ascends to the genital atrium in a series of loops. The metraterm is weakly muscular; the uterus is largely intracaecal but intermittently and irregularly extends beyond the lateral margins of the caeca. Laurer's canal curves gradually sinistrad to the dorsal body wall.

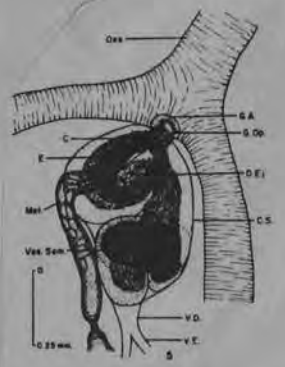
Vasa efferentia and *vas deferens* are as described in *X. hirakudensis*. An enlarged, tubular seminal vesicle is coiled tightly within the cirrus pouch which it almost fills. *Pars prostatica* and prostate gland are weak. The cirrus is muscular.

Host: *Naja naja* (L.): Indian cobra.
Habitat: Gall bladder.
Holotype: U. S. National Museum Helm. Coll. No. 39055.
Locality: Sambalpur, Orissa, India.

Remarks: *X. sambalus* differs importantly from *X. biliphaga* and *X. piscator* in that its ovary is distinctly smaller than either of its testes, its vitellaria are entirely pre-testicular and its testes are appreciably larger than in those species. Its intestinal crura are much slenderer than those of *X. biliphaga*.

X. sambalus is from the same organ and species of host as *X. solus* and *X. hirakudensis*. The vitellaria in our three specimens of *X. sambalus* are very uniform and do not extend posteriorly to the level of the anterior testis whereas in *X. hirakudensis* the vitellaria extend just beyond the anterior margin of the anterior testis and in *X. solus* they extend beyond the posterior border of the posterior testis. The testes of *X. sambalus* are nearly in the same plane whereas those of *X. hirakudensis* are on a distinct diagonal and those of *X. solus* are even more distinctly and widely separated on a diagonal. The excretory bladder of *X. hirakudensis* bifurcates between its testes but that of *X. sambalus* bifurcates well anterior to the testes, just posterior to the ovary. *X. sambalus*, with a length/width ration of 2.3, is much broader than *X. hirakudensis* (3.73), and slightly broader than *X. solus* (2.7).





XENOPHARYNX

Genus : *Xenopodistomum* gen.n. Macnea, Rock and Makowski, 1973

These are plagiorchid flukes of the sub-family Plagiorchinae with :

Body divided, fore-body tapered, anteriorly, rounded ; hind body foliate : oral sucker terminal, mouth ventro-terminal ; acetabulum close to junction of fore-body and hind-body, small ; pharynx round, muscular ; prepharynx short oesophagus extending half way down the fore-body, long ; intestinal caeca unbranched : genital aperture sub-medial, in front of the acetabulum : testes intracaecal, symmetrically placed in the broadest part of the hind-body : ovary large, centrally placed, Laurer's canal present : receptaculum seminis large, saccular ; vitellaria lobed, more or less paired, behind the acetabulum : uterus occupying most of the hind part of the body: eggs embryonated : parasitic in gall bladder of *Xenopus laevis*. It appears to be close to *Glypthelmins* Stafford, 1905.

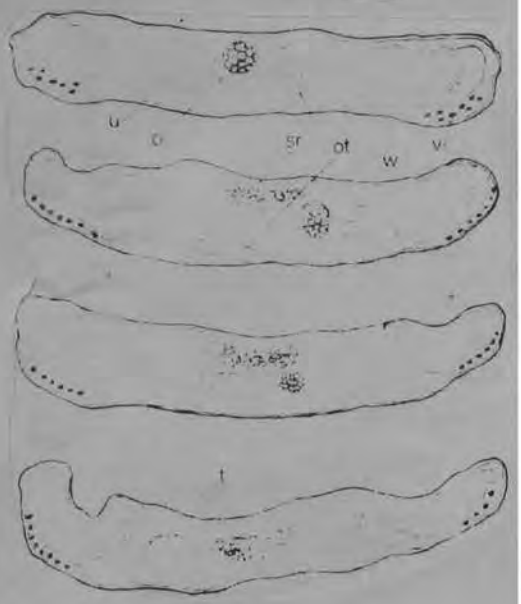
XENOPODISTOMUM XENOPODIS ~~sp. nov.~~ Macnea, Rock and Makowski, 1973

[Type specimen is no. T6 in the collections of the Veterinary Research Institute, Onderstepoort, Pretoria.]

This fluke is regularly to be found in the gall bladder of *Xenopus laevis*, it occurs in small numbers but as many as 8 have been taken from an infected bladder. Such infected gall bladders are yellowish and granular in appearance due to the faecal products of the flukes.

When fixed and flattened this fluke is up to 8 mm long with a maximum width of 4 mm. The narrow fore-body and the wider hind body are sub equal in length. In two specimens the portions measured 3 and 2·8 mm, and 3·4 and 3·0 mm after flattening and fixation. When alive the edges fold inwards ventrally. The edge of the body is finely crenulated and while alive varied from being quite smooth to showing folds like a finger print. The oral sucker is small but strongly muscular, it is terminal and surrounds the ventro-terminal mouth. The acetabulum is approximately the same size as the oral sucker. It lies near the posterior end of the "neck".

The buccal cavity leads into a short prepharynx which leads into a well developed pharynx. The oesophagus extends about half way down the "neck" and divides into two intestinal caeca which pass down the sides of the body to the posterior end.



The gential pore is situated in the "neck" immediately behind the forking of the gut. The large irregularly lobed testes lie symmetrically ventral to the caeca. They vary between 48 and 80 μ mm in diameter and their external lateral margins encroach on the caecal field but only slightly. The vasa deferentia run from each testis towards the centre and join to form a common duct which runs up the "neck" towards the genital pore where it forms a cirrus apparatus, comprising a short prostatic portion, a short seminal vesicle and a short cirrus.

The ovary is usually smaller than either testis varying in size between 24 and 28 μm. It lies in front of them, a short distance behind the widening of the body. Immediately behind it there is an oötype and Mehlis' gland, and a large saccular receptaculum seminis varying in size between 88 and 140 μm and pear shaped in form. The narrow part lies above the ovary and the oötype, and bulges behind them to occupy the whole of the space between the muscular layers of the body wall. Laurer's canal is present. The vitellaria consist of a more or less symmetrically arranged series of lobules connected to one another by a narrow duct. The lobules partially embrace the gut caeca and extend from behind the acetabulum to the limit of the gut caeca posteriorly. The uterus is loosely coiled in the hind body passing downwards to the tip of the body then coils forward to pass to the genital aperture. The eggs are small and embryonated.

The excretory system is Y-shaped, the lateral canals running down the body outside the gut caeca. The terminal portion is vesicular.

Comment : These flukes are clearly Plagiorchid and somewhat resemble the more common genus *Glypthelmins* from which they differ in the distinct division of the body into two regions in this resembling the Gorgoderid genus *Phyllodistomum* and in the arrangement of the genital system.

Elkan (1960) gives an illustration which closely resembles this species, it is a section of a fluke in the gall bladder of a specimen of *Xenopus laevis*.

XENOPODISTOMUM

Zeugorchis Stafford, 1905

Syn. *Caudorchis* Talbot, 1933

Plagitura Holl, 1928, partim

Paralechriorchis Byrd et Denton, 1938

Generic diagnosis. — Plagiorchiidae, Styphlodorinae: Body elongate, flattened elliptical, with blunt extremities, spinulate. Acetabulum may be smaller or larger than oral sucker, usually pre-equatorial. Oral sucker and pharynx well developed. Esophagus usually short, ceca half-long or may be longer or shorter. Testes symmetrical, just posterior or medial to cecal ends, nearer to caudal end than to midbody or vice versa. Cirrus pouch may or may not extend backward beyond acetabulum. Genital pore median, postbifurcal. Ovary postacetabular, more or less out of median line. Vitellaria extending along ceca for their greater part, occasionally extending over testes on their outer side. Uterus intercecal, posttesticular, reaching to posterior extremity; metraterm well developed. Excretory stem with short arms. Parasitic in alimentary canal of reptiles.

Genotype: *Z. aequatus* Stafford, 1905 (Pl. 55, Fig. 669), in *Thamnophis sirtalis;* Canada.

Representatives from reptiles:

Z. boscii (Cobbold, 1859) Stafford, 1905, in *Coluber* sp.; America.

Z. eurinus (Talbot, 1933), syn. *Caudorchis e.* T. 1933, in *Thamnophis sauritus* and *T. sirtalis;* Michigan.

Life history similar to that of *Lechriorchis primus*, flame cell formula 2×6×3. Metacercaria in *Rana clamitans, R. pipiens* — Walton (1947, 50).

Z. natricis Holl et Allison, 1935, in uterus (?) of *Natrix sipedon;* Pennsylvania.

Z. syntomentera Sumwalt, 1926, syn. *Pseudorenifer s.* (S.) Allison et Holl, 1937, in mouth and alimentary canal of *Thamnophis sirtalis* and *T. ordinoides;* N. America.

Xiphidiocercaria develops in *Physa gyrina*, penetrates skin of tadpoles but not of adults of *Hyla regilla, Rana aurora* and even of *Triturus torosus*. Infected tadpoles were fed to young garter snake, *Thamnophis ordinoides*, with positive results, though the flukes were not reared to maturity. — Ingles (1933).

Z. syntomenteroides Parker, 1941, in *Thamnophis sirtalis sirtalis;* Florida.

PARALECHRIORCHIS Byrd & Denton, 1938

This genus was based on two morphological features:
1. The presence of a short, stout cirrus sac which extends the short distance from acetabulum to genital pore.
2. The presence of a well developed and muscular metraterm that equals the cirrus sac in length.

This genus does not seem to differ from Zeugorchis. In the type species, P. syntometra (Sumwalt, 1926), the length of the metraterm varies considerably in proportion to the length of the cirrus sac. see Pseudoleniger Price.

Zeugorchis aequatus Stafford, 1905

Description.—Body elliptical (fig. 12, B), 1.9 mm long by 629μ wide; cuticula spiny. Oral sucker subterminal, 255μ in diameter; acetabulum 187μ in diameter, 422μ posterior to oral sucker. Prepharynx very short; pharynx 136μ long by 100μ wide; esophagus 170μ long; intestinal ceca relatively slender, extending to near level of anterior poles of testes. Genital aperture median, immediately posterior to intestinal bifurcation. Cirrus pouch 425μ long by 120μ wide, slightly oblique to long axis of body and with its base posterior to acetabulum. Testes oval, unequal, side by side near posterior end of body; right testis 270μ long by 170μ wide, left testis 200μ long by 170μ wide. Ovary globular, 170μ in diameter, median, immediately posterior to acetabulum. Vitellaria largely dorsal, forming wide band across body and extending from level of genital aperture to within short distance of tips of ceca. Uterus consisting of a single loop, descending limb slender and somewhat convoluted, extending to posterior end of body; ascending limb relatively wide; metraterm relatively short and muscular, to left of cirrus pouch. Eggs oval, 44μ long by 22μ wide.

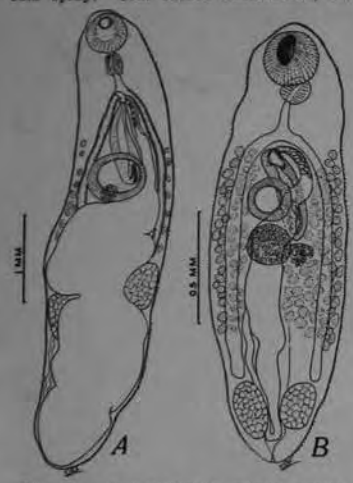


FIG. 12. A—*Lechriorchis primus*, ventral view. B—*Zeugorchis aequatus*, ventral view.

Specimen:—U.S.N.M. Helm. Coll. No. 6890 (labelled type), collected by J. Stafford from *Eutaenia sirtalis* L. (= *Thamnophis sirtalis*) at Montreal, Quebec.

A comparison of this species with specimens of *Caudorchis eurinus* Talbot shows that the two forms are congeneric, and *Caudorchis* Talbot must fall as a synonym of *Zeugorchis* Stafford. *Z. eurinus* (Talbot) appears to be distinct from *Z. aequatus* (Stafford) in having a shorter cirrus pouch, smaller ovary and less extensive vitellaria. The species included by Talbot (1934, loc. cit.) in the genus *Zeugorchis*, viz., *Z. bosci* (Cobbold), *Z. ancistrodontis* (MacCallum), *Z. syntometra* Sumwalt and *Z. megametricus* Talbot are not congeneric with *Z. aequatus* Stafford and cannot be retained in that genus. *Distoma bosci* Cobbold, which Stafford regarded as belonging to the genus *Zeugorchis*, cannot well be included at present in *Zeugorchis* or any of the related genera; the median genital aperture and the extent of the intestinal ceca seem to relate it more closely to *Dasymetra* Nicoll than to any of the other genera.

Zeugorchis longicirrus — Odhner, 1938

Family *Plagiorchiidae* Lühe, 1901; subfamily *Renniferinae* Pratt, 1903.

Specific diagnosis: Medium-sized worms with a length of 3.74–4.42 mm. and a width of 1.32–1.74 mm. The body of the living worm is concave ventrally with a short dorsal lip at the anterior end. Cuticula is entirely covered with small spines. Oral sucker is subterminal, 0.535–0.592 mm. by 0.464–0.571 mm. The acetabulum is located in the middle third of the body and measures 0.499–0.571 mm. by 0.464–0.606 mm.

The prepharynx is 0.030–0.042 mm. in length. The large muscular pharynx, 0.235–0.285 mm. by 0.335–0.371 mm., is divided anteriorly into three lobes. Pharyngeal glands are present as two large groups, one on either side of the pharynx. The esophagus is 0.142–0.214 mm. in length. The intestinal ceca are wide with blunt ends and extend lateral to the testes almost to the posterior end of the body.

The excretory system, as far as could be determined, consists of a Y-shaped bladder the arms of which extend around the acetabulum.

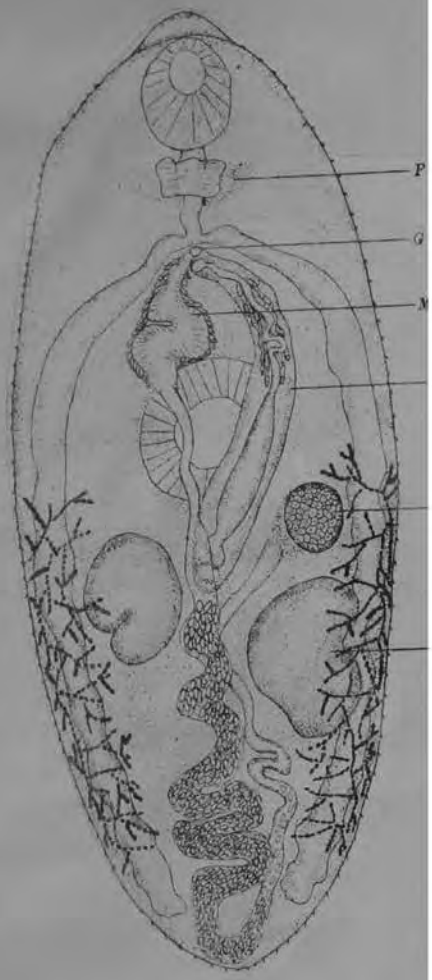
The testes are large, the anterior one being located on the left side and measuring 0.535–0.537 mm. by 0.321–0.499 mm. and the posterior, 0.531–0.642 mm. by 0.321–0.442 mm. They may or may not be lobed and are situated obliquely in the posterior half of the body. The vasa efferentia arise from the anterior ends of the testes and unite as they enter the cirrus sac where they discharge into the large coiled seminal vesicle. The cirrus pouch is extremely long, measuring 1.21–1.35 mm., and extends from the genital pore posteriorly to the level of the anterior testis. Prostate glands are numerous and surround the sperm duct anterior to the seminal vesicle. In one specimen the cirrus was observed in an extruded condition.

The ovary is usually roughly spherical but may be somewhat oval. It measures 0.249–0.285 mm. by 0.214–0.235 mm. and is situated on the right side of the body at the posterior-lateral margin of the acetabulum. The uterus consists of two loops, descending and ascending, both of which are coiled. At the anterior end of the acetabulum the uterus ends in a very muscular, glandular, coiled metraterm which opens into the genital pore located immediately posterior to the bifurcation of the intestinal ceca. Metraterm and cirrus sac are widely separated.

The vitellaria are dendritic and consist of distinctly separated follicles, dorsal and lateral to the ceca. The follicles extend from the region of the acetabulum almost to the ends of the ceca. From the center of each group a duct passes mesiad, the two becoming connected in the region of the ootype.

The eggs are light brown and measure 33μ by 18μ. They are operculate and those in the terminal portion of the uterus contain miracidia.

Zeugorchis longicirrus differs from all the previously described species of the genus in the possession of a greatly elongated cirrus sac. It differs from the type, *Z. aequatus* Stafford, in its larger body size, position and size of the testes, position of the ovary, length of the cirrus pouch, and extent of the vitellaria. It differs from *Z. eurinus* (Talbot) in its larger body size, position of the testes, length of the cirrus sac, and extent of the vitellaria. It differs from *Z. natricis* Holl and Allison in the size and position of the testes, size of the ovary, position of the vitellaria, and presence of pharyngeal glands. It differs from *Z. megametricus* Talbot and *Z. syntomentera* Sumwalt in the larger body size, position of the genital pore, position and arrangement of the vitellaria, and greater size of the oral sucker and acetabulum. It differs from *Z. ancistrodontis* (MacCallum) in being of smaller body size, in having larger testes, smaller ovary, and in having longer ceca. It differs from *Z. brachyoesophagidius* (Allison and Holl) in its larger body size, larger testes and ovary, and longer ceca.



Zeugorchis longicirrus ~~n. sp.~~ Odlaog, 1938

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The excretory system, as far as could be determined, consists of a Y-shaped bladder the arms of which extend around the acetabulum.

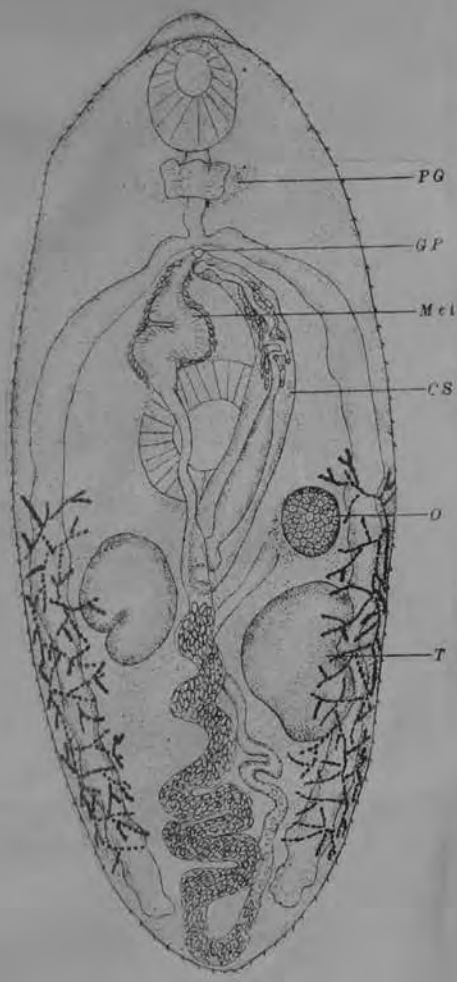
The testes are large, the anterior one being located on the left side and measuring 0.535–0.557 mm. by 0.321–0.499 mm. and the posterior, 0.531–0.642 mm. by 0.321–0.442 mm. They may or may not be lobed and are situated obliquely in the posterior half of the body. The vasa efferentia arise from the anterior ends of the testes and unite as they enter the cirrus sac where they discharge into the large coiled seminal vesicle. The cirrus pouch is extremely long, measuring 1.21–1.35 mm., and extends from the genital pore posteriorly to the level of the anterior testis. Prostate glands are numerous and surround the sperm duct anterior to the seminal vesicle. In one specimen the cirrus was observed in an extruded condition.

The ovary is usually roughly spherical but may be somewhat oval. It measures 0.249–0.285 mm. by 0.214–0.235 mm. and is situated on the right side of the body at the posterior-lateral margin of the acetabulum. The uterus consists of two loops, descending and ascending, both of which are coiled. At the anterior end of the acetabulum the uterus ends in a very muscular, glandular, coiled metraterm which opens into the genital pore located immediately posterior to the bifurcation of the intestinal ceca. Metraterm and cirrus sac are widely separated.

The vitellaria are dendritic and consist of distinctly separated follicles, dorsal and lateral to the ceca. The follicles extend from the region of the acetabulum almost to the ends of the ceca. From the center of each group a duct passes mesiad, the two becoming connected in the region of the ootype.

The eggs are light brown and measure 33μ by 18μ. They are operculate and those in the terminal portion of the uterus contain miracidia.

Zeugorchis longicirrus differs from all the previously described species of the genus in the possession of a greatly elongated cirrus sac. It differs from the type, *Z. aequatus* Stafford, in its larger body size, position and size of the testes, position of the ovary, length of the cirrus pouch, and extent of the vitellaria. It differs from *Z. eurinus* (Talbot) in its larger body size, position of the testes, length of the cirrus sac, and extent of the vitellaria. It differs from *Z. natricis* Holl and Allison in the size and position of the testes, size of the ovary, position of the vitellaria, and presence of pharyngeal glands. It differs from *Z. megametricus* Talbot and *Z. syntomentera* Sumwalt in the larger body size, position of the genital pore, position and arrangement of the vitellaria, and greater size of the oral sucker and acetabulum. It differs from *Z. ancistrodontis* (MacCallum) in being of smaller body size, in having larger testes, smaller ovary, and in having longer ceca. It differs from *Z. brachyoesophagidius* (Allison and Holl) in its larger body size, larger testes and ovary, and longer ceca.



Species	Body	Oral sucker	Acetabulum	Testes	Ovary	Ceca	Circ. sac
Z. aequatus Stafford, 1905	1.0 by 0.625 mm.	0.25 mm.	0.18 mm.	0.27 by 0.17 mm.	0.17 mm.	to testes	0.42 mm.
Z. aeschrodactyli (MacCallum, 1921)	2 by 2 mm.	0.7 mm.	1 mm.	0.33 mm.	0.40 mm.	to testes	
Z. cystomeniers Sumwalt, 1926	1.27–2.82 by 0.39–0.70 mm.	0.23 to 0.31 mm.	0.39 mm.	0.24 to 0.15 mm.	0.09 to 0.07 mm.	to testes	0.35 mm.
Z. curinus (Talbot, 1933)	1.94–3.27 by 0.58–0.78 mm.	0.29 to 0.38 mm.	0.29 to 0.38 mm.	0.15–0.26 by 0.12–0.18 mm.	0.10 to 0.14 mm.	to posterior end	0.27 to 0.37 mm.
Z. megametricus Talbot, 1934	1.93–3.40 by 0.67–0.93 mm.	0.26 to 0.37 mm.	0.36 to 0.47 mm.	0.41 to 0.20 mm.	0.18 mm.	not beyond acetabulum	0.58 mm.
Z. natricis Holl & Allison, 1935	6.34 by 1.57 mm.	0.63 by 0.55 mm.	0.56 by 0.53 mm.		0.37 by 0.36 mm.	to testes	short
Z. brachyoesophagidius (Allison & Holl, 1937)	1.97 by 0.68 mm.	0.3 mm.	0.32 mm.	0.28 by 0.20 mm.	0.15 mm.	to testes	0.47 mm.
Z. longicirrus, n. sp.	3.74–4.42 by 1.32–1.74 mm.	0.53–0.59 by 0.46–0.57 mm.	0.49–0.57 by 0.46–0.60 mm.	0.53–0.64 by 0.32–0.44 mm.	0.24–0.28 by 0.21–0.23 mm.	to posterior	1.21 to 1.35 mm.

Price (1935) selected *Z. megametricus* as type of the new genus *Pseudorenifer* and accepted the diagnosis of *Zeugorchis* as given by Talbot (1934) for *Pseudorenifer*. He gave no reason for the erection of *Pseudorenifer* or list of differences between *Pseudorenifer* and *Zeurgorchis*. *P. megametricus*, the type of *Pseudorenifer*, differs from *Z. aequatus*, the type of its genus, in the location of the genital pore, relative position of the cirrus sac and acetabulum, position and extent of the vitellaria, length of the digestive ceca, position of the testes and extent of the uterus, and the position of the ovary. Whether these differences are of generic significance appeared doubtful to Price since his erection of *Pseudorenifer* was "tentative."

Allison and Holl (1937) accepted the genus *Pseudorenifer* and placed their new species *P. brachyoesophagidius* in it. They stated that *Pseudorenifer* differed from *Zeugorchis* "in the position of the testes and the length of the ceca." If the genus *Pseudorenifer* is valid it must differ from all other related genera in a particular pattern or set of characters. Comparison of *P. megametricus* and *Z. aequatus*, using the above stated differences as criteria, indicates that they represent distinct genera. However, *Z. longicirrus* presents features intermediate between and common to both *Z. aequatus* and *P. megametricus* which show a closer relationship between them than is revealed by examination of the data above.

In *P. megametricus*, the genital pore has shifted slightly forward and laterad, the cirrus sac has correspondingly shifted forward and does not extend posterior to the acetabulum. The vitelline follicles are more condensed, the testes have shifted forward so that the uterine coils extend into the post-testicular region, and the digestive ceca are reduced in length. This forward shift of the organs has not changed the essential pattern found in *Z. aequatus* but has merely changed their position. The differences appear to be of specific rather than generic significance. *Z. longicirrus* possesses characteristics of both *Z. aequatus* and *P. megametricus*, the long-cirrus pouch extending posterior to the acetabulum and the long ceca of *Z. aequatus*, and the anteriorly-shifted testes and posteriorly-extending uterine coils of *P. megametricus*. These facts lead the writer to believe that *Pseudorenifer* is not a valid genus and should fall as a synonym of *Zeugorchis*.

Plagiorchidae
Reniferinae

Zeugorchis syntomentera Sumwalt, 1926

See Price Pseudoreniferr
Byrd Pseudohiorchis
in detail

From Ingles, 1933

The adult of *Zeugorchis syntomentera* was described in detail by Sumwalt (1926), so only a general description with supplementary notes needs to be given here.

Twenty-six garter snakes, *Thamnophis ordinoides*, from the vicinity of Berkeley, California, were examined between August, 1931, and July, 1932, and only four contained flukes of this species. The heaviest infection came from a medium-sized snake from a pond in Wildcat Canyon where *Hyla* tadpoles are abundant. This snake had two adult flukes in the mouth, one adult in the oesophagus, and about thirty young flukes, of sizes varying down to metacercarial dimensions, in the intestine. The only other snake with adult flukes harbored two in the mouth, but had no immature forms. This might suggest that the natural habitat for the adult is the mouth, and that possibly the eggs escape from that unusual location.

The average length of five mature flukes is 1.097 mm.; the width, 0.64 mm. The average dimensions of the oral sucker are 0.31 mm. wide by 0.26 mm. long. The acetabulum is 0.40 mm. long and 0.39 mm. wide. The oesophagus is 0.097 mm. long. The eggs average 48μ by 24μ. The entire body is covered with minute spines (not shown in figures) which may be sloughed off during fixation. The caeca do not quite reach the testes, which are slightly oval and bilaterally symmetrically placed. Pharyngeal glands are prominent, as is also a scalloping of the anterior part of the pharynx. There is a large seminal vesicle and prostate in the large cirrus sac. The excretory vesicle is very large and irregular and shows up well in individuals stained with Mayer's hemalum. The vitellaria are somewhat in two groups. One group on each side is lateral to each caecum, and the second is posterior to it.

Reported by Sumwalt from:
Thamnophis ordinoides, western garter snake
T. sirtalis

Life cycle described by Ingles in 1933

GENUS PARALECHRIORCHIS BYRD AND DENTON, 1938 = Pseudoramifer Price 2

Paralechriorchis syntomenteroides n. sp. Pavrer, 1941

(Plate I, Fig. 4)

Specific diagnosis: Paralechriorchis. Body moderately elongated, with rounded anterior end, and slightly tapering to pointed posterior end, 1.95 (1.66-2.26) mm. long by 0.71 (0.63-0.77) mm. wide, widest in acetabular region. Cuticula beset with spines becoming sparse near posterior end. Oral sucker 0.26 (0.25-0.29) mm. in diameter. Prepharynx present, not very long. Pharynx 0.12 (0.09-0.15) mm. in diameter, with gland cells. Oesophagus short, about 0.04 mm. long. Acetabulum 0.41 (0.36-0.51) mm. long by 0.43 (0.39-0.51) mm. wide, located just anterior to body middle. Caeca pouched, especially posteriorly, ends usually dilated and directed slightly inward, terminating between posterior edge of acetabulum and posterior edge of testes, usually somewhat anterior to testes. Genital pore median, just behind bifurcation of caeca, or displaced slightly to left, rarely to right or a short distance behind bifurcation. Testes parallel or nearly so, irregularly elongated or with lateral notches, rarely smoothly oval. Left testis 0.24 (0.17-0.32) mm. long by 0.15 (0.13-0.19) mm. wide. Right testis 0.28 (0.22-0.32) mm. long by 0.16 (0.13-0.26) mm. wide. Cirrus sac moderately large, 0.39 (0.30-0.51) mm. long by 0.11 (0.09-0.12) mm. wide, extending from just behind right posterior margin of acetabulum to genital pore, containing much coiled vesicula seminalis, oval pars prostatica, slender ductus ejaculatorius, and slightly muscular cirrus which is sometimes everted. Ovary smooth to irregularly oval, rarely pear shaped, located partly over or just over right posterior edge of acetabulum, measuring 0.16 (0.10-0.22) mm. long by 0.13 (0.11-0.17) mm. wide. Vitellaria extending from level of anterior edge of acetabulum or a little posterior to that level into the testicular zones, mostly lateral, sometimes dorsal or ventral, or both, to caeca; follicles rounded, not very large. Uterus typical, extending from ovary down one side, more often the right, and up the other side, moderately coiled and slightly pouched. Metraterm well developed, muscular, about as long as cirrus sac. Ova numerous, operculated, 13-20 by 35-40 μ.

Host: Thamnophis sirtalis sirtalis (Linné). Twenty-four miles west of Melbourne, Florida. Location: Oesophagus.

Type Specimen: U. S. Nat. Mus. Helm. Coll. No. 9393.

Remarks: Varying numbers of these parasites were found in seven of eight garter snakes. Mature specimens were found only in the oesophagus, but immature ones were scattered throughout the stomach and small intestine. This species is very closely related to *P. syntomentera* (Sumwalt, 1926), but may be distinguished by its proportionally larger acetabulum, longer cirrus sac, larger testes and ovary, larger pharynx, and more posterior vitellaria.

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